INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Vol. 25
No. 7

PUBLISHED MONTHLY BY THE BRUCE PUBLISHING COMPANY, 524–544 NORTH MILWAUKEE STREET, MILWAUKEE, WISCONSIN
Eastern Office: 330 W. 42nd St., New York, N. Y. — Western Office: 66 E. South Water St., Chicago, Ill.

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VACATION TIME

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION wishes its many readers a pleasant and profitable vacation time.

May the weather be just right, summer school enjoyable and exhilerating, the swimming good, the fish large and numerous, the tours trouble-free, railroad fare and hotel rates low, and the homecoming the best of all.

IN THIS ISSUE

For readers of this magazine who are interested in craft and art metal work, "Enameling for Beginners" might be recommended. For those who have the good fortune of possessing a summer home, the article on "Slab Furniture" may be of special interest. For those who even in vacation time want to continue planning for the school year, the article on the "Profile-Type Rating Card," or "Organizing Printshop Production," or the "Guiding Principles in Planning a Course in Woodwork" may have special appeal. For those interested in architectural drawing, the test and scoring sheets which were chosen for this month's supplement may be interesting. For the camping instructor, there is a "12-In. Open-Cockpit Motorboat" that will entrance the boy.

Besides those mentioned, there are other articles which we hope will prove appealingly satisfactory.

THIS MONTH'S COVER

The picture chosen for the cover this month shows the open-pit method of mining bauxite — aluminum-bearing ore.

Photograph courtesy Aluminum Company of America, Pittsburgh, Pennsylvania.

Articles Indexed—The articles contained in the Magazine are regularly indexed in "The Reader's Guide to Periodical Literature," and "Education Index."
Entered Jan. 2, 1914, as second-class mail matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1936, by The Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, Nov. 25, 1930.
Subscription Information—Subscription price, $2.50 per year, payable in advance. Canadian postage, 25 cents, foreign countries, 50 cents. Copies not over three months old, 25 cents; more than three months, 50 cents. Notice for discontinuance of subscription must reach Publication Office in Milwaukee, at least fifteen days before date of expiration. Changes of address should invariably include old as well as new address. Complaint of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.
Editorial Contributions—The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.
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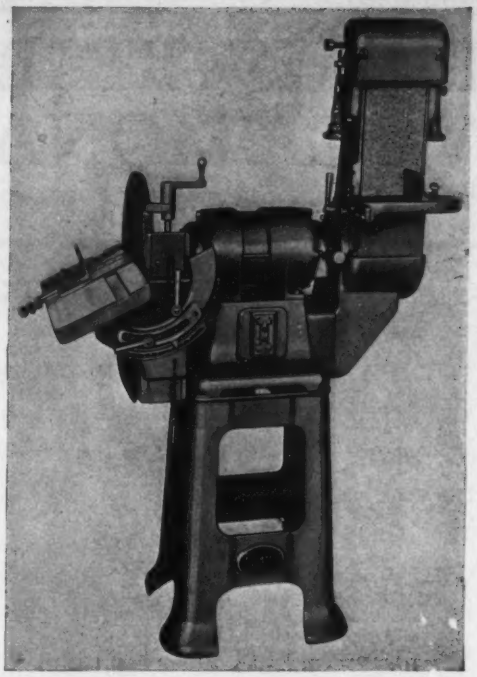

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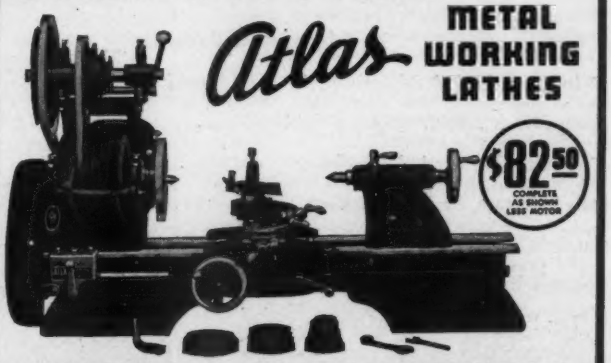

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ATLAS QUALITY

July, 1936
Vol. 25, No. 7

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

The General Shop and the Student

Harold J. Davison

Northeastern High School, Detroit, Michigan

The author shows how a unit shop may be transformed into a general shop. He also outlines the duties for the student foremen who are appointed to supervise the various activity groups in such a shop.

The visualization of the duties of pupil foremen composing the personnel staff of a school-shop organization is most easily accomplished when accompanied by a vivid mind picture of the growth of the general-shop idea. The general shop is not the result of a radical departure from accepted procedures, but rather the result of a gradual broadening of the scope of shop ideas to conform to the needs of the pupils.

The general-shop idea has come in response to the demand for socialized courses of study. The traditional unit shop is too narrow to meet the requirements of a broad social instructional program.

Establishing Units

The instructor of a unit shop who wants to establish a general shop should not attempt to establish it as such, but rather permit it to evolve gradually from his original unit shop. The general shop is self-developing, and comes in response to the need and the desires of the pupils. The activities of a unit shop are increased to take care of the various interests of the pupils in the classes, and thus the continual, but slow, broadening of activities grows into the general shop.

This enrichment of the course of study may be accomplished with little expenditure for additional equipment. The additional equipment necessitated by the inclusion of the various contemplated activities should be carefully considered before a decision is made. It must be borne in mind that the determination of essential equipment is very largely dependent upon the objectives of the course. The general shop lends itself particularly well to industrial-arts courses, while vocational and technical education may best be served by specialized unit courses taught in a unit shop.

Let us consider a traditional manual-training shop equipped for woodwork. This shop may be equipped for only bench work in wood or it may have a few lathes and other power machinery. The instructor has a pupil assistant, called the superintendent, who takes care of a number of routine matters in class procedure, as well as having general supervision over the shop during the actual work period.

Along comes a boy who is particularly interested in electricity, a boy who has, perhaps, done some experimenting along electrical lines at home. During a class discussion two or three boys show a marked interest in this activity and express a desire to receive additional instruction, as well as an opportunity to exchange ideas with the other boys with a similar bent.

The time is now ripe for the instructor to suggest the possibility of an electrical unit. It is possible for him to set aside a couple of benches in one corner of the room which will henceforth be known as the electrical unit. If funds are unavailable for the purchase of supplies the pupils can ordinarily be depended upon to bring in all that is needed. Later this unit should have a place in the shop budget along with the other recognized activities included in the course.

Selecting Foremen

The presence of a "key" boy makes the choice of the first foreman of this group a very simple matter. Since he is in more or less complete charge of the group his duties as foreman will be correspondingly clear. His specific duties will necessarily be in accord with the instructor's particular plan of shop management. Aside from his routine foreman duties this "key" boy would be in a position to act in the capacity of assistant instructor for his group.

With the addition of activities in the shop, the student superintendent's responsibilities become increased. Such a situation calls for an enlarged pupil-personnel organization. In a single-activity shop the superintendent might be quite able to assume the leadership of the group activity. In a multiple-activity shop it is advisable to have a foreman for each group. In our hypothetical set-up it would now become necessary to appoint a woodwork foreman. This first boy selected should be the outstanding boy of the group. His position would then be similar to that of the "key" boy in the electrical group.

Since the general shop has come in response to the demand for socialized courses of study, we must recognize that social efficiency is one of our major objectives. In the school shop this social efficiency may best be developed by a systematic plan of rotation of the pupils composing the pupil-personnel organization. The plan should be so devised that each pupil in the class may have ample opportunity to participate as a member of the staff, irrespective of his outstanding attributes. It is not meant that no cognizance should be taken of individual characteristics, but rather that, after considering the boy's qualifications and the requirements of the position, each boy should receive the opportunity to function as a member of the pupil-personnel staff in the position for which he is best suited, even if a boy who has previously been a member of the staff is better qualified for the job. In this way each boy experiences the problems arising on both sides of the shop-management problem.

The instructor must bear in mind that the duties and responsibilities of the various staff positions must be clearly outlined if proficiency is desired. It is not to be expected

that the novice will instinctively do the correct thing. Definite instructions are essential to a smooth-running shop organization.

Large classes and a greater variety of activities within the shop call for a more complex shop organization. Under such conditions the foreman's job is a full-time proposition. If the groups are small the foreman may find time to carry on projects of his own.

Duties and Responsibilities of the Foreman

The greater the number of activities carried on in a general shop, the greater the number of foremen required. As each new activity is added to the course, a foreman should be appointed for the group. The size of the general shop, that is, the room in which these various activities are carried on, the equipment of the shop, the number of pupils in the class, the number of pupils in each group, the supplies and materials available, the arrangement of the shop, the manner in which tools are distributed, the various teaching and checking devices used, the method of instruction used, as well as the pupil personnel organization itself, influences the responsibilities and duties of these foremen. In every instance it will be found that there are a number of duties and responsibilities that are common to the foremen of each group.

It is impossible to discuss the exact duties which are common to all pupil foremen in a given general shop unless the set-up of the shop, as indicated by the factors just enumerated, is known, but an attempt will be made to suggest some of them. It must be kept uppermost in mind that it is unreasonable to expect the pupil foreman to function well without a complete understanding of what is expected of him. To this end, detailed instructions concerning his job have been found exceedingly helpful.

To reduce to a minimum the repetition which would occur if the foremanship job of each group was treated as entirely differing from that of any other, the responsibilities and duties common to all pupil foremen may be listed and the comparatively few duties peculiar to the foremen of any given group may be considered in detail later.

The following activities and functions should be included in the list of responsibilities and duties common to all pupil foremen in a large multiple-activities shop.

1. *General supervision of own group.*

The pupil foreman should be made to feel his responsibility for the general conduct of the boys in his group and that much of the progress or retardation of the group is dependent upon him and his ability as a foreman.

2. *Supplying the necessary tools for his group at the beginning of the work period.*

It has been found that if the tools ordinarily used in a given group are arranged in a sort of kit, and obtained from the tool crib at the beginning of the work period by the various foremen that the initial rush to the tool crib is eliminated. The foreman is thus personally responsible for all of the tools secured by him from the tool crib. Upon occasion the individual members of the group may obtain any additional tools that are needed without causing undue confusion at the tool crib.

3. *Get stock and material for his group when directed by the instructor.*

Delegating to the foremen the responsibility of issuing material and stock to the members of his group gives the instructor an opportunity to check all of the supplies distributed. In this manner a record may be kept of all the material used by each individual member of the class. This seems highly desirable, whether the supplies are paid for by the pupil or whether they are furnished by the school. Requiring the instructor's O.K. on all material requisitions is an easy way to keep the amount of wasted material to a minimum.

4. *Help individual boys when necessary.*

When it is possible to do so, keeping in mind that each boy should be given an opportunity to serve as a member of the pupil-personnel staff, the foreman of each group should be chosen because of his marked ability in the particular activity in question. The tendency of the foreman to do a boy's work for him rather than to assist him to do the work himself, should be carefully guarded against.

5. *Keep record of boys in group.*

Each foreman should keep a record of all the boys in his group at a given time. The boys should be checked out of one group before being assigned to another. If no record is kept of the members in each group, confusion often results. Such a condition offers an opportunity for the foreman to "pass the buck" if one of his boys is not conducting himself as he another group and that some other foreman was responsible ity he may declare that he thought the boy belonged to another group and that some other foreman is responsible for his actions. Confusion may also exist upon the return of an absentee. This is especially true if the particular group is overcrowded. An accurate record of the assignment of boys to the group will materially aid in the distribution of boys as they move from one activity to another.

6. *Check jobs in notebooks of individual members.*

Having the foreman check the time of starting and the time of completion of each project in the individual's own notebook will greatly assist the instructor in keeping an accurate check on the work accomplished by each pupil.

7. *Call the attention of the Safety Engineer to faulty equipment.*

Frequently the foreman is in a position to detect faulty equipment, or dull or burred tools which have been overlooked by the safety engineer.

8. *Report all infringement of shop rules to the superintendent.*

Since social efficiency is accepted as an objective of all shop courses, it is necessary to take cognizance of those pupils who cannot accommodate themselves to the rules of the shop.

9. *Return tools and unused supplies to the tool crib at the close of the work period.*

The foreman must not only return the tools for which he is personally responsible, but he must also see that the members of his group return all tools to the tool crib.

10. *Supervise the cleaning up of his section of the shop.*

As in industry, neatness and order should be the rule in the school shop. The following class is greatly handicapped if the preceding class has left the general-shop room in a poor condition. Except for shavings and other minor refuse on the floor, the general-shop room should be as neat, clean, and orderly at the close of the school day as it was before the first class in the morning.

11. *Make his daily report to the superintendent.*

After the tools and supplies have been checked in, the shop cleaned up, aprons and projects put in their proper places, and the boys have returned to their original positions, the foreman should make his final report to the superintendent. This report may consist merely of his O.K. or it may include any irregularities which may have come to his attention during the work period.

A Commencement Address

Robert C. Woellner

Executive Secretary
University of Chicago
Chicago, Illinois

To many of us, commencement addresses are dry and tiresome. This one is full of important matter which ought to be made part of what the boy ought to get out of his technical high-school course.

Foremost in the minds of the graduates today is the question, "Where do we go from here?" If, by chance, your answer is college, you are merely postponing for four years the real answer to the question. Now, or four years hence, today's high-school graduate must face the greatly complicated world of productive industry. If the present conditions of affairs are not according to your fondest wishes, despair not. They never were. Your forebears found obstacles to overcome, and their successes have made life easier for them and for you. Out of toil, sacrifice, ingenuity, and determination has developed our American pattern of life.

This industrial society, which they have built, and which you young graduates now face, should be observed from three points of view. First, you should observe some of the benefits to society as a whole which have been derived from the vast industrial organization established in this country. Secondly, you should observe some of the effects of this great industrial machine upon the individual worker. And thirdly, you should try to determine what all this is going to mean to you personally.

No great amount of time need be spent here in a discussion of the benefits of industrial development to our people as a whole. You know what those benefits are, and the major characteristics of our machine age. Without an occasional reminder, however, we tend to overemphasize in our thinking and feeling the toil, the struggle, the limitations, the handicaps, rather than the benefits which we get. There never was, and there never will be, a generation of men that received something for nothing. Every invention, every convenience that you enjoy today, represents a background of human work and sacrifice. What has been done for you, you will be called upon to do for others.

One cannot give the slightest thought to present-day society without a feeling of awe and appreciation for the things which have been made possible by the industrial processes of today. We have and may use the automobile, the radio, heating systems, cooking utensils, electric lights and electric appliances, and many other things made possible by a system of production unknown to our great grandfathers. You young graduates of this "push-button" generation come upon a heritage which you should appreciate; appreciate so that you enjoy it, and appreciate so that when you are placed in a position to do your part, you will feel that occasional inconveniences and hard work are worth while and are justified.

Our Industrial Civilization

This great industrial machine, of which all workers are a part, has certain characteristics to which attention will be hurriedly given. The making of so vast a variety of commodities, and in so large amounts, necessitated the development of speed in production. Modern industry is perhaps best characterized by speed. Faster and faster moving have become our operations of production. New inventions have made yearly more rapid our means for turning out goods. There seems to be sound evidence that even during the economic depression the increase in the speed of production went feverishly forward. Reducing speed as a solution for our industrial ills seems idle talk. Make up your minds that the industrial world which you are to enter will continue to emphasize those factors which tend to speed up the doing of things.

There is a second characteristic of modern industry. The whirl with which manufacturing is carried on has emphasized "efficiency" in every aspect of business and commercial life. Efficiency of machine and of personnel is causing a constant change in both. Time studies of the motions of men and machines correct any inefficient links in the chain of production. The life of industry is competition, and competition emphasizes the doing of things in the shortest possible time and thereby reducing costs to a minimum.

There is a third characteristic. Efficiency has become the mother of inventiveness. The urge to accomplish tasks in a superior fashion has challenged industry to do them in different and improved ways. New "gadgets," new methods, new procedures for routing raw materials through manufacturing processes, have placed a premium upon ingenuity and have given inventiveness full opportunity. Each new invention suggests other possibilities, and this stimulation will continue to be exerted with increasing acceleration as industry expands and develops. Those who long for a return of the "good old days" when the operations of production were less complex are entertaining a vain hope. It may be safely predicted that instead of becoming simpler, our industrial processes will continue to become increasingly more complicated.

Moreover, speed, efficiency, and inventiveness suggest a fourth characteristic of current industrial life — a continual and rapid change in methods of work and in occupations. A study of an industrial plant today reveals many machine tools and processes unknown to employers and employees of that same plant five or ten years ago. A well-trained mechanic of yesteryear, with no subsequent training, would be a misfit in industry today. Ever since the earliest aspects of that phase of American development which historians speak of as the Industrial Revolution, change has characterized our industrial life. With the advance of years the change has become more rapid. There is no reason for us to assume that from now on industrial life will remain static. So much for the benefits and characteristics of the machine age.

The Worker and Modern Industry

Now let us turn our attention for a few moments to the second aspect of our observations, namely: the effects of modern industrialism upon individual workers. There are especially five of these effects which are described here without being evaluated as to their social implications.

The first of these effects is the age limits which are grad-

ually being established for employment, especially that of a certain type. Juvenile workers have little place in plants using modern machinery. It does not pay industry to use child labor upon expensive machines, working with costly materials. On the other hand, the pace set by machine processes taxes physical strength to the point at which the older worker finds it difficult to become re-employed if for any reason he is out of employment. Many corporations have established upper age maximums for employment of workers. Such policies give the middle-aged worker cause for concern. Of course, upper age limits for employment vary with the type of work demanded of the worker. Heavy manual labor of a routine sort demands younger bodies than any other types of work. In occupations in which accumulated experience is meaningful, the upper years for employment are extended. The worker who is prepared to supervise has a better chance for re-employment after middle life than the worker who can do no more than the routine type of labor.

The second effect of our industrial age upon the worker, the problem of maintaining physical and mental vigor, is closely related to the one we have been considering. The speed and efficiency of modern work has brought about new mental and physical requirements for the workers. Although the hours of work per week have been reduced, nevertheless this shorter working week takes more nervous energy from the workers than the longer working week under less tense conditions. Speed creates a nervous tension which requires a high degree of mental and physical energy. Interesting studies are now going forward in industry, which eventually will throw light upon the relation of fatigue to competency, accidents, and mental attitudes of workers.

Closely allied to this subject is the third effect of the present-day industrial life upon the worker, which I wish to mention. This is the monotony resulting from continuous repetition. The division of labor carried to the point where each worker is engaged in a very small operation means repeating that same operation over and over again within a limited working period. There is a sameness about the tasks which any worker performs, but the modern industrial worker is especially given to routine performance on the job.

At times, of course, changes in the type of machines used or in the routing of the jobs force the worker into a different series of motions. In a rapidly developing industry these changes come quite frequently, when measured in terms of years rather than in terms of weeks or months. The need for being equipped to meet changes is another effect of industrial life upon the workers.

The final effect upon which I wish to comment concerns vocational opportunities. Although the division of labor has reduced many vocations to mere unit operations, it has created new types of positions. For instance, in the days when the cabinetmaker made the entire piece of furniture, he planned his work as he went along. Today, each operation in the making of that same piece of furniture is performed by a different worker. The planning and routing of the various operations are left to a new type or types of workers. The supervision, inspection, and accounting of production have created new kinds of jobs. The so-called "collar-and-tie" job has become more important as our industrial society has evolved.

Now, how does all this concern you who graduate today? Does it affect you, and if it does, in what way? People react to vocational life in several different ways. There are those who believe in the philosophy of chance. "If you get the breaks," say they, "you will move along; if you don't you are just out of luck and that is that." They are partially correct. Chance is an element in any human situation. However, to say that progress in vocational life is entirely a matter of chance is a gross exaggeration; and, besides, is an attitude of mind which betrays the individual who holds to it.

In recent times another attitude has developed. That attitude places the responsibility for our industrial problems upon the social group as a whole. It assumes that by governmental regulation, social planning, industrial codes, and so forth, the individual worker will be cared for, and that he need only concern himself with the social aspects of the industrial problems, and forget about himself — an insignificant part of a great machine.

Some people assume a still different attitude toward vocational problems. They accept chance as an element in the situation, and hope that social progress will give them an increasingly large return for their labors, but in addition they feel a large responsibility for their part in vocational success. It is to those of you who hold to this point of view that I wish to direct a few remarks regarding the implications of the present industrial set-up for you as individuals.

Industry Asks for Trained Workers

First, permit me to congratulate you upon the fact that along with your general education you have received a specialized kind of training which enables you to do something as well as to think. If and when vocational opportunities in industry occur, only those are sought who have training — specific training for a job. You will also discover, if you have not already discovered, that experience is a great asset in obtaining a position. Don't become discouraged if your lack of experience proves a handicap to you. Try to get experience, even under circumstances not fully to your liking. You may have to start at a level in the scale of employment somewhat lower than a high-school diploma would suggest. But try to get started.

Once on the job, the careful observer will begin to sense what has been said about the physical and mental health requirements for success in industry. To be really successful a young person must be able to do more than stay on the job, although that, at first, might require all you have to offer. If the young worker does not look ahead to advancement, he may find that at too early an age in life he is "through." What has been said about the shortening of the years when workers are employable refers to the routine workers whose work is characterized by physical activities. The new vocational opportunities in planning and supervisory positions should lie ahead for those who have technical training, as you have, and who, in addition, have industrial experience of a routine type and have continued to grow. You need to look ahead. I realize that looking ahead is not always an easy thing to do. There are many difficulties which you will encounter in trying to do so. Some of these should be mentioned.

Keeping oneself in physical and mental health is not always foremost in our minds. Maintaining sufficient energy to meet job requirements, plus the extra amount needed to continue the desire to advance, means placing physical and mental health above extravagantly good times, late hours, excessive smoking, etc. There are so many tempting occasions to spend our energies needlessly, that it takes double courage and foresight to continue to keep ourselves fit for service. The rewards, of course, are many. In addition to being a factor in vocational success, vigor usually means a better point of view toward life and more fun from just living. A wholesome attitude toward life is its own reward.

Another obstacle which you will have to face as time goes

on is the monotony of routine work. All work becomes routine in time. Accustoming oneself to a certain amount of routine is a good discipline. Routine work becomes harmful when the worker permits it to make him part of the machine. Not to see above the daily grind is disastrous to the individual's progress. You have one possession which should save you from the ill effects of routine, and that is the education and training which you have already received. Your schooling should tend to intellectualize your daily work. You should be unlike the worker who, when asked why he was chewing tobacco, replied, "Because it gives my head something to do." Your intellectual interests should grow out of your work, and those with intellectual interests need never fear the monotony of work, whether that work be in the factory, the office, the field, or the kitchen. Keep alive the habit of developing interests such as those which you have had an opportunity to develop in school, and you will never be bored.

Another problem which you must prepare yourself to face is that of change in the kind of work which you will do. New machines, new processes, yes, and new industries have been introduced and will continue to be introduced. What became of those engaged in the carriage industry when the automobile superseded the horse and buggy? I will venture an opinion that not all the workers could adjust themselves to a new kind of work. A personnel man in industry told me a short time ago that when his corporation found it necessary to change from the use of one kind of machine to another, about fifty per cent of the workers could not make the adjustments necessary for working with success upon the new machines. Fifty per cent of the workers had to be scrapped with the machines. How do you account for that? In routine positions (and all positions become more or less routine) there is a tremendous tendency for an individual to become so much a part of his particular work that he limits his thoughts, his actions, his life, to it. In time he becomes so much a part of it that he cannot change. Such an individual finds it impossible to change when a change becomes necessary. He is frequently out of step, not realizing what has happened. To keep up with the times, and to keep fit in the broadest sense of the term, are not only your obligation toward your job, no matter what job it is, but also your obligation toward social progress.

To keep abreast of the times, two things are necessary. First, one has to have a very good understanding of the present situation; and second, one has to have a view toward the future. The first is as important as the second. Change can be understood only in terms of the present. Your best basis for understanding the future is the training you now possess concerning the present. The engineer who understood best the working of the gasoline engine used in an automobile was in the most advantageous position to work into the airplane industry. New operations, new machines, new processes, are outgrowths of old ones. To understand what might develop tomorrow, get fully acquainted with what is happening today. When you obtain a position, get to know thoroughly how your work should be done. You will be aided in doing this by the splendid background of training which you have already received. In passing, I might add that your study of the social situation should proceed in much the same manner.

When learning of the present, however, try to keep an open mind for the changes which the future will bring. Be prepared to progress with the times. Don't become set in your ways or unfriendly to new ideas until you are ready for retirement. The desire to continue to grow mentally and occupationally is an attitude of mind. It is an old and a faulty psychology which teaches us that one stops growing mentally when one has reached maturity. Make this truly your time of commencement, at which time you resolve that you will commence your journey toward an increasingly broader, more profound, and spiritually higher level of intellectual life.

Age at Entrance and Term of Stay

Max S. Henig

Newark, New Jersey

While this study was made in 1929, and while the term "student" may probably be better than "apprentice," nevertheless the study shows a method and a purpose which might be well followed by shop teachers elsewhere.

Vocational industrial-school apprentices enroll at an age at which in most communities they are already eligible to apply for their "working papers." This, of course, puts to immediate test the holding power of these schools, a power that is further tested by the very nature of the training these schools give. Industrial-school apprentices soon become "job-minded." The modicum of training they have received, no matter how brief their stay in school, increases the temptation to take the first lucrative job that offers. In the light of these conditions, a study of the holding power or apprentice turnover in vocational industrial schools would in all probability yield some extremely interesting and valuable data.

The following is an account of an investigation not nearly so ambitious but one that has some value as indicative of the type of study suggested. It is a statistical inquiry into the relationship between the age at entrance of industrial-school apprentices and their term of stay. The study covers the period from the opening of the school, in which this study was made, in February, 1926, to the end of January, 1929. This three-year period for this study is particularly suitable, since the school over most of this period was giving a three-year course. During this time, the school obtained, either by transfer from other units of the system or by enrollment, 736 apprentices, of whom 495 left during the period under observation. Table I and Figure 1 give the ages of these boys at entrance, and for each age-group gives also the number and per cent to leave, to graduate, and still attending.

As was originally stated, the school at its opening received a goodly number of apprentices by transfer from other units of the system. Since the possibility exists that such a change, if undesired, might have influenced some of these boys to leave who otherwise would have stayed to graduate, a separate study was made of the 139 boys who enrolled originally between the months of Feb-

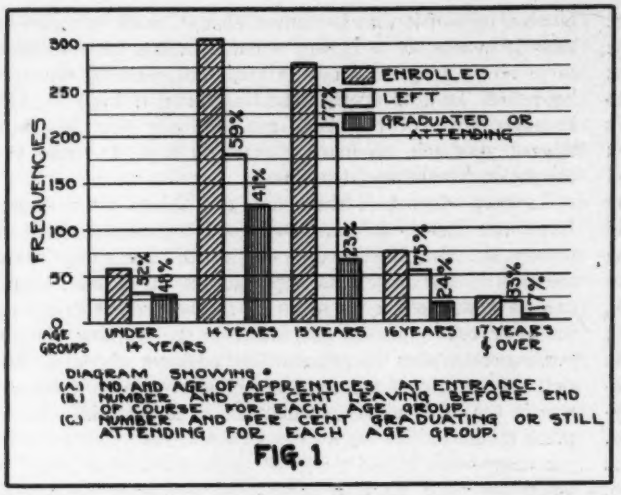


DIAGRAM SHOWING
(A.) NO. AND AGE OF APPRENTICES AT ENTRANCE.
(B.) NUMBER AND PER CENT LEAVING BEFORE END OF COURSE FOR EACH AGE GROUP.
(C.) NUMBER AND PER CENT GRADUATING OR STILL ATTENDING FOR EACH AGE GROUP.

FIG. 1

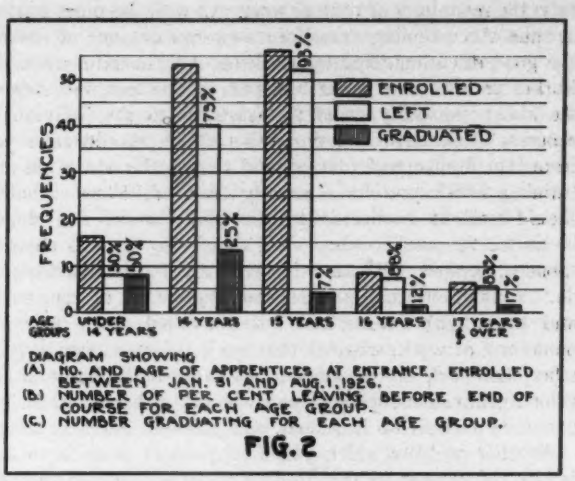


DIAGRAM SHOWING
(A.) NO. AND AGE OF APPRENTICES AT ENTRANCE, ENROLLED BETWEEN JAN. 31 AND AUG. 1, 1926.
(B.) NUMBER OF PER CENT LEAVING BEFORE END OF COURSE FOR EACH AGE GROUP.
(C.) NUMBER GRADUATING FOR EACH AGE GROUP.

FIG. 2

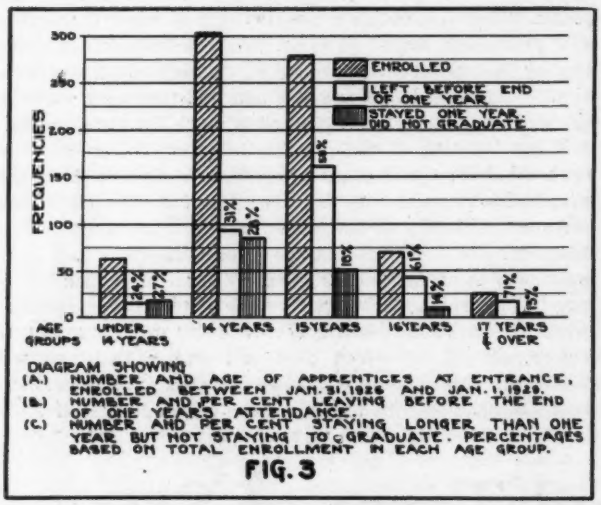


DIAGRAM SHOWING
(A.) NUMBER AND AGE OF APPRENTICES AT ENTRANCE, ENROLLED BETWEEN JAN. 31, 1926 AND JAN. 1, 1929.
(B.) NUMBER AND PER CENT LEAVING BEFORE THE END OF ONE YEARS ATTENDANCE.
(C.) NUMBER AND PER CENT STAYING LONGER THAN ONE YEAR BUT NOT STAYING TO GRADUATE. PERCENTAGES BASED ON TOTAL ENROLLMENT IN EACH AGE GROUP.

FIG. 3

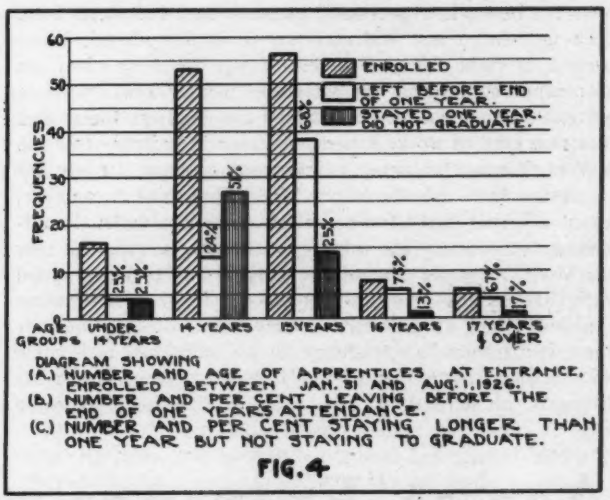


DIAGRAM SHOWING
(A.) NUMBER AND AGE OF APPRENTICES AT ENTRANCE, ENROLLED BETWEEN JAN. 31 AND AUG. 1, 1926.
(B.) NUMBER AND PER CENT LEAVING BEFORE THE END OF ONE YEAR'S ATTENDANCE.
(C.) NUMBER AND PER CENT STAYING LONGER THAN ONE YEAR BUT NOT STAYING TO GRADUATE.

FIG. 4

Table I

Age at entrance of apprentices and number and percent in each age group (1) leaving before end of course, and (2) graduated or still attending. February, 1926, to January, 1929, included.

Age at entrance	Number enrolled	Left before end of course	Percent	Graduated or attending	Percent
Under 14	62	32	51.6	30	48.4
14 " 15	302	179	59.1	124	40.9
15 " 16	277	211	76.5	65	23.5
16 " 17	71	53	74.7	18	25.3
17 " 18	24	20	83.3	4	16.7
Totals	736	495	67.2	241	32.7

Table II

Age at entrance of apprentices enrolled from February to July, inclusive, 1926, and number and per cent in each age group (1) leaving before end of course, and (2) graduating.

Age at entrance	Number enrolled	Left before end of course	Percent	Graduated	Percent
Under 14	16	8	50.0	8	50.0
14 " 15	53	40	75.4	13	24.5
15 " 16	56	52	92.9	4	7.1
16 " 17	8	7	87.5	1	12.5
17 " 18	6	5	83.4	1	16.7
Totals	139	112	80.6	27	19.4

Table III

Age of apprentices at enrollment and those in each age group (1) leaving before the end of a year's attendance, and (2) staying longer than a year but not staying to graduate. All apprentices enrolled between February, 1926, and January, 1929. All percents based on total enrollment in each age group.

Age at entrance	Number enrolled	Left before end of year	Percent	Stayed one year Didn't graduate	Percent
Under 14	62	15	24.2	17	27.4
14 " 15	302	94	31.0	85	28.1
15 " 16	277	161	58.1	51	18.4
16 " 17	71	43	60.6	10	14.1
17 " 18	24	17	70.8	3	12.5
Totals	736	330	44.6	166	22.6

ruary and July, 1926, and so had the opportunity to complete their course during the time covered by this study. Table II and Figure 2 present for this group, first, the number and per cent leaving without completing the course, and second, the number and per cent graduating.

Table II rather strongly emphasizes what the preceding data had already revealed, namely, that the older a boy was when he entered this school, the more likely he was to leave without completing the course for which he had enrolled. The correspondence between the age at entrance and the likelihood of withdrawal before graduation for both groups is considerable. That in each age group except the under-14-year-olds, the per cent of withdrawals is somewhat

larger for the group for which the data are presented in Table II is as expected. Of the group accounted for in Table I, many enrolled late in the period covered by this study, and so were still in school yet would undoubtedly leave instead of staying to graduate.

The outstanding facts revealed so far are: (1) that four out of every five boys to enroll in this school leave without completing their courses; (2) that the best showing in this respect, namely, staying till graduation, is made by the under-14-years-old group, one out of every two of whom graduated; and (3) that the older the apprentices were when they enrolled, the more likely they are to withdraw from school before completing the courses for which they enrolled.

Table VI
Age at leaving of apprentices enrolled from February to June, 1926, inclusive. All percents based on Total to Leave, 112

Age at leaving	Number enrolled	Percent
Under 15	15	13.4
15 " 16	34	30.3
16 " 17	51	45.5
17 " 18	12	10.7
Totals	112	99.9
16 years plus or minus 2 months	37	33.0

Term of Stay

The accumulated data also made it possible to study the holding power of the school in one other way, that being in terms of the length of stay of those who did leave. Tables III and IV and the corresponding graphs, Figures 3 and 4, show, first for all apprentices, and second for only those enrolled between the months of February and June, 1926, (1) the number and per cent leaving before the end of their first year, and (2) the same facts for those staying more than a year but not graduating.

With both groups, the conspicuous fact is that most of the withdrawals from school occur within one year from the date of entrance. In fact, in the 15-, 16-, and 17-years-and-over age-groups, from three to four times as many left during their first year as stayed beyond the first anniversary of their enrollment.

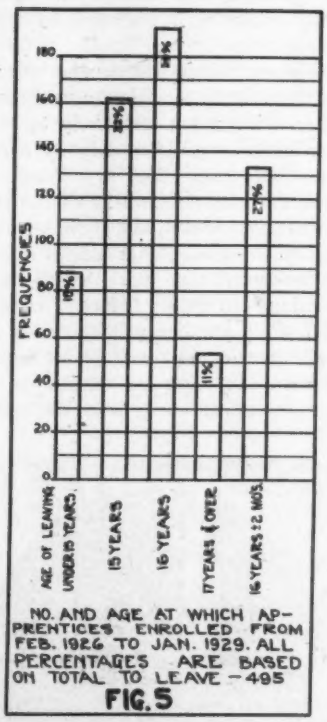
Age at Leaving

On his sixteenth birthday, every boy in this school is legally free to leave. Also, with but comparatively few exceptions, everyone entitled to enroll is of age when he may apply for working papers. These facts naturally raise the question of the age at which these apprentices did leave school. Table V and Figure 5 present this information for the entire vocational-school enrollment; Table VI and Figure 6 give the same data for the group enrolled between the months of February and July, 1926.

It is evident that only approximately 50 per cent of the apprentices who leave this trade school celebrate their sixteenth birthday while in attendance; also that of the total number to leave, 90 per cent do so before reaching the age of 17.

Table V
Age at leaving of apprentices enrolled from February 1926 to January, 1929. All percents based on Total to Leave, 495.

Age at leaving	Number enrolled	Percent
Under 15	88	17.8
15 " 16	161	32.5
16 " 17	192	38.8
17 " 18	54	10.9
Totals	495	100.0
16 years plus or minus 2 months	133	26.9

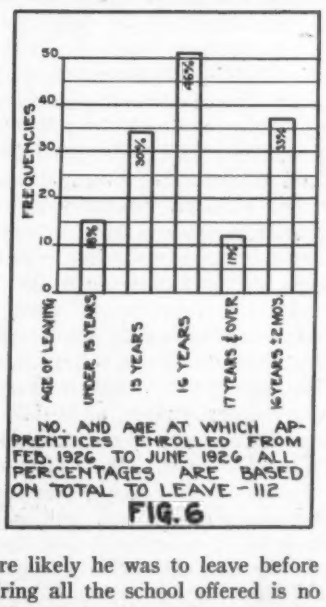


NO. AND AGE AT WHICH APPRENTICES ENROLLED FROM FEB. 1926 TO JAN. 1929. ALL PERCENTAGES ARE BASED ON TOTAL TO LEAVE - 495
FIG. 5

The period immediately prior to and after the sixteenth birthday deserves special notice. Included in both Tables V and VI and the corresponding figures was the number of those to leave within two months, before or after, of their sixteenth birthday. According to these figures, about three out of every ten who leave do so within one or two months of reaching the age of emancipation. Evidently, while the number of boys who entered the vocational school solely with the intention of marking time till the law freed them from the compulsion of attendance is considerable, it is not vital to the welfare of the school. The majority of the boys who enrolled did so in good faith, desirous of acquiring the fundamentals of certain vocations. That the older the boy the more likely he was to leave before acquiring all the school offered is no reflection upon his seriousness of purpose. The increased-age increased-withdrawal-percentage correspondence measures, in all probability, the degree of economic pressure experienced by the apprentices of this school.

Table IV
Age at entrance of apprentices enrolled from February to July, 1926, inclusive, and number and percent in each age group (1) leaving before the end of a year's attendance and (2) staying over a year but not staying to graduate.

Age at entrance	Number enrolled	Left before end of year	Percent	Stayed one year Didn't graduate	Percent
Under 14	16	4	25.0	4	25.0
14 " 15	53	13	24.5	27	50.9
15 " 16	56	38	67.9	14	25.0
16 " 17	8	6	75.0	1	12.5
17 " 18	6	4	66.7	1	16.7
Totals	139	65	46.8	47	33.8



NO. AND AGE AT WHICH APPRENTICES ENROLLED FROM FEB. 1926 TO JUNE 1926 ALL PERCENTAGES ARE BASED ON TOTAL TO LEAVE - 112
FIG. 6

Enameling for Beginners

GertrudeS.Twichell

Boston, Massachusetts

In this article, the author describes how to enamel etched metal work.

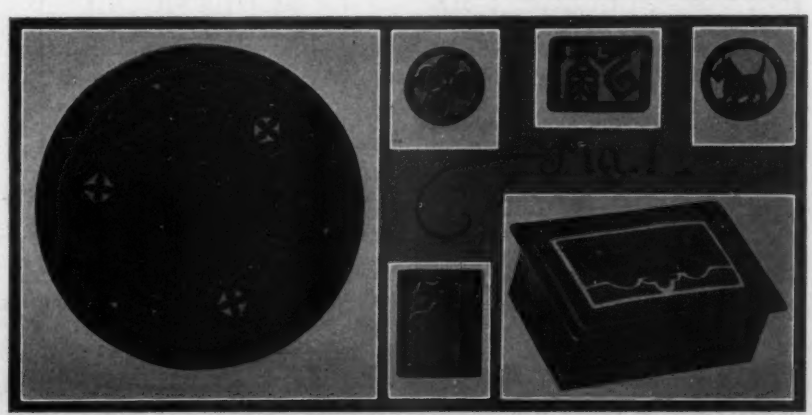
A first lesson in enameling was given in detail on page 183 in the May, 1934, issue of this magazine. If you are a beginner it will be best to study that article thoroughly before attempting any of the problems described in this new lesson, as space does not permit repeating all the small but very necessary details of the work. One thing which does need constant repeating — because even some of the more experienced slip up at times when in a hurry! — is a warning to be careful, and then more careful. It is very wise, and saves much disappointment, to "stop, look, and *lessen*" little inaccuracies and carelessnesses. A circle that isn't exactly accurate but near enough, looks so tremendously wobbly when filled in with colored enamel; and a tray which comes out such a heavenly golden yellow would have been perfect — *if* there hadn't been those two black specks of something right in the middle; and *if* one had only remembered to protect the soldering, that catch wouldn't have come off after the brooch was all done — ! If all the little things are remembered at the proper time, there won't be any big "if" when it is too late.

In the May, 1934, article, is described the process of enameling a silver brooch which had been made by soldering a saw-pierced design to a solid background, thus forming hollows in which the enamel was laid. This time a different and somewhat easier method will be described although it will require just as much care. This is the enameling of etched work, and can be made just as simple or elaborate as one wishes. Indeed there is much fun in trying out different ways and effects when working with enamels. Simple brooches, buckles, or fobs with animal designs will appeal to the younger workers, while the more advanced ones may like to experiment with a tile or box like those illustrated. This method can be adapted for use on any number of different articles, the main point to remember is that the firing of the enamel will leave the metal in a more or less softened condition, and this must be taken into account in planning work.

The brooches, tile and rectangular box shown in Figure 1 have a plain border which could be judiciously hammered, thus hardening the copper enough so it did not bend in use. Silver is much stiffer than copper and there is less danger of its bending and cracking the enamel, but it is not always practical to use it. Therefore, on any metal, the work should be planned so as to avoid possible cracking. On bookends, for instance, it would seem much wiser to make the ornamentation on separate panels and rivet these to a heavy background, rather than to enamel directly on the book end itself and then try to harden the metal. The riveted panel relieves the enamel of any strain that the hammering might cause or that might come later in using the one-piece book ends. The panels can be riveted to the background directly, or a slightly larger piece of metal can be used as a sort of mat between panel and back. Another way is to set the enamel with a bezel and encircling wire, the way one would set a stone in jewelry. In any case it is safest to have the enameled part of the panel, whether a brooch or a larger piece, domed up a little, and also have a fairly wide plain border that can be lightly hammered if necessary to flatten or harden it.

All these things will depend more or less upon the type of design used, small spaces being much less likely to crack than larger ones. It is only by experiment and study that one learns the limitations and possibilities of this most fascinating medium, and there seems no limit to the study! One enamel may be tough enough so that it will stand plunging into pickle before it is really cold, while another will crack or chip if allowed to cool the least bit fast. In all cases an irregular texture to the background will help hold the enamel in place. If the etching process itself does not produce a rough ground, this may be obtained by using chasing or engraving tools. When using opaque enamels the under ground will not show, but with transparent enamels one must plan for an interesting roughness, however made, or the entire effect may be spoiled. Engine turning is an example of one process that is used as a means of decoration and also as a method of roughening the surface to retain the enamel more firmly. This is a machine process, of course, but one can always learn something from the machine, if for no other reason than to learn what not to do!

In etching designs for brooches, planish a piece of copper somewhat larger than the finished piece, and not thinner than 18 gauge (B. and S.), to give it a smooth surface. It is not easy to smooth or polish the copper much after the enameling is done, without injuring the enamel, therefore it is best to do this planishing beforehand. Also, the hammering forces out any gas that may be in the metal, thus preventing possible future difficulties caused by the appearing of bubbles in the enamel. After planishing, clean the metal in the sulphuric pickle, then dip it or brush it over with slightly diluted nitric acid, washing off in running water and drying it at once on a clean cloth. A clean soft



Examples of enameled etched work

brush will aid in this washing. It is well to wipe over the surface then with denatured alcohol to remove any possible grease which the acid may not have touched. Thereafter handle the metal only by the edges.

Next, trace the design carefully on the clean copper, using carbon paper, and placing the pattern so that at least an eighth of an inch of waste metal is left on all sides of the line indicating the outer edge of the article. This excess material is left so that if the acid happens to eat into the edge, no harm will be done. Unexpected etched lines and bites are very much to be avoided, as they usually are too deep to be removed.

Black asphaltum or other acid resist is needed next. This must be painted over all spaces of the design which are *not* to be eaten out. Have a very small camel's-hair brush for the design and a larger one for the background. Work very carefully, carrying the paint over (that is, on top of) the carbon lines. This must be done because the carbon lines sometimes act as a resist and prevent the acid from eating through the uncovered lines, thus making ragged edges. If lines of the tracing are inaccurate in places, remove them with a dull knife point. When the paint has set a little, edges can be corrected with the knife point, also. If too wet, the paint will blur during this correcting, while if too dry, it may chip off. One must experiment a little to find out just how to handle the different mediums. Again, it is well to "stop, look, and lessen" inaccuracies. It takes longer to paint a design perfectly, but it takes very much less time than it does to try to correct a badly traced or carelessly painted one. After the design is finished, paint over all the remaining surface that is not to be eaten away. Take particular pains to see that every bit is covered, including back and all edges, and leaving no bubbles in the paint. When the article is dry enough to handle, touch up the places that may need it, such as edges where one was holding the piece. Then it must be thoroughly dried before going any further. Asphaltum varies in drying, according to condition of paint and atmosphere, and from one to twelve hours may be needed.

One may buy prepared etching mordants and acid resists for both copper and silver which work very satisfactorily, although the asphaltum paint and nitric acid may be used if one cannot get the others. One must experiment a little with the acid, as the strength will vary, but ordinarily 2 parts water and 1 part acid is used. This may be weakened or strengthened as necessary. It is wise to use the acid only where a window can be open, as the fumes are very obnoxious. Use rubber gloves or fingers in working with nitric, and carefully avoid getting the acid on anything it should not be on. If any gets on the skin, wash it off in clear water at once, as it makes ugly stains which later peel off. If it gets on clothing, douse with ammonia, then wash off in water. *Intelligent care, however, will prevent mishaps.*

Always have the water in the glass receptacle first, then add the acid to the water. The glass should be on a bench or table, not in the hands, when mixing. Clean a small piece of copper as directed above, then put it in the acid for a moment. If the acid makes fumes or bubbles, the mixture is too strong, and water must be added.

It is best for the beginner to prepare a small piece of metal with a bit of a design on it, so the action of the acid can be tested before trying a larger article. Prepared resists or acids should be used according to their directions, although it is well to test these also. A properly mixed nitric-acid solution should take from two to four hours to eat into the metal a sufficient distance, that is about half its thickness. If it works much faster than that, there is danger that it will undercut or work under the resist and make ragged outlines, or cause bits to chip off from the background, thus spoiling all the previous work. If there is no appreciable eating away after about fifteen minutes, the acid is presumably too weak, and a bit more must be added. It is well to examine the work frequently, as sometimes tiny bits of the resist will come off after a while, and must be retouched and dried before being put back. If the original resist is a slow-drying one, a bit of melted wax may be used to quickly cover a hole in the background.

When the design is sufficiently etched, remove it, wash in clear water, and remove the asphaltum with kerosene. Then heat the metal to dull red, pickle and clean it. Saw out or cut the metal to correct outline shape, then dome it up slightly with a small wooden mallet or round-end stick, holding the brooch face down on a thick cloth pad or wooden mold. Do this gently so the etched edges do not get flattened, or the background pushed in to their level. Then lay the brooch face up on a smooth surface and flatten the border by tapping with the wooden mallet. This leaves the flat space which can be hammered to harden it, as mentioned earlier. It also makes a flat place to which the hinge and catch should be soldered, using what is called enamel solder, or the hardest flowing silver solder you have. Be sure plenty of solder is used to hold securely. Pickle the article, clean with nitric acid, and proceed to lay in the enamel as described in the first lesson, not forgetting to bank the solder with yellow ochre to prevent its burning out while the enamel is being fired. After enameling, polish the article carefully, and oxidize if desired. The oxidizing fluid for either silver or copper is made by dissolving a piece of liver of sulphur in proportion of a piece about the size of a pea to a pint of water. Dip the metal in this, or brush it on with a soft toothbrush until the desired color is obtained. If solution is too strong, the color will come off in patches. Use it diluted and stop the instant the color is deep enough. Wash, dry, and then very lightly scratch-brush the article. A bit of liquid wax rubbed on, dried and lightly polished will help the metal keep its color, and will also prevent finger marks to a great extent.

The copper tile shown in the illustration is about 4½ in. in diameter, with a base about ⅜ in. high. The base in this case has three sawed out sections, designed to relieve the plainness. The number of cutouts would depend upon the design on the top. This ring should be large enough so that it does not come directly under any enameling, that is, there should be a slightly wider plain border of metal on the top than there is on the under side, so that the flame can come directly under the enamel without hindrance from the base. The etching should be done before the base is soldered on.

In making circular things like this, it is very important that the exact center be marked both front and back, as this center will be needed later as a guide mark. Scratch a light cross exactly through the center point, using a sharp instrument. It is also most necessary that the border lines be true, as all inaccuracies will show up badly when the etching is finished, and it is practically impossible to correct them then. Try these circular lines first with a pencil compass, correct your traced design where necessary, and then go over the lines with steel dividers. This will give sharp, permanent edges and make the

painting of the design much easier. Later, the center point will be needed in drawing in the compass lines for the outer edge of the tile and for the placing of the base.

For any intricate etched design, the enamel should be ground fairly fine in order to fill small spaces completely. If very carefully done, only one firing will be needed. If a second is required, the nitric-acid cleaning must be repeated before adding more enamel. The enamel should not come above the surface level of the metal when finished.

In the original tile, a rich transparent orange was used as background color, with a few accents of opaque turquoise blue. The design was left mostly in the metal while the ground was etched out. Either transparent or opaque enamels may be used, although yellow and orange will probably be most attractive in the transparent, as they show up better on the copper. A much larger range will be found in opaque colors, as various blues and greens as well as yellow and orange are available. Care must be taken, however, that the color does not make the background spaces stand out instead of the design. By testing a section of the design with water colors on paper before etching, one will learn something of the effect to be obtained by leaving the design in relief and using a softly colored background. Or one may find it better to reverse the process and fill the etched-out design with color, leaving the raised copper ground. Sometimes a combination of the two is effective; for instance, the flowers in a running design could be in color with narrow raised outlines, while the leaves were left in copper and the background either enameled or left with just the etched surface. This type has been used where only touches of color were needed.

A still different method was shown in one small box which had a very interesting peacock design on the cover, the entire panel being enameled with opaque colors separated only by narrow outlines of the metal. This effect is similar to that of cloisonné but of course takes very much less time than would the latter. In working out a design in this fashion, the metal outlines must be kept very even and smooth, which means a perfect painting-in of the pattern before the etching is done. When enameling, extreme care should be taken so that no particles of enamel get fired on the metal outlines. The surface of the enamel should be made as smooth as possible. Occasionally one can file or stone down the entire surface so that enamel and metal outlines are all even, but this means an extra firing, acid treatment, and polishing, and the result is apt to look machine made. Results are much more charming if work is so carefully done that this stoning down is not needed.

The box in Figure 1 was made in one piece with four corners soldered. A three-section hinge was used, two narrow sections being soldered to the box and the longer center section on the cover. This hinge may be soldered to the cover before or after the enameling, either method presenting its own little difficulties. If put on first, the hinge must be banked with yellow ochre to prevent burning out the solder when firing the enamel, otherwise the hinge might drop off in process of heating. If the enameling is done first, the hinge may be soldered on by holding it in place with cotter pins or metal clips, the cover being propped up so that the flame goes only against the back of it. Direct flame must never be allowed to play on enamel. The enamel will show little cracks when the hinge is being soldered on. If the heat has not been sufficient to smooth out these little cracks by the time the solder has run, a little more heat must be given.

The cover will be rather soft after firing, but it may be hardened sufficiently if the aforementioned plain border has been left. Use a slightly convex hammer, holding the cover on a flat metal stake, and tap lightly several times around the border. Heavy tapping will stretch the metal. Be very careful to avoid touching the center or raised portion enclosing the design. If the enamel does by chance crack in process of hardening the metal, one must just fire the piece again and try the hardening over again more gently.

Experienced workers can design quite elaborate boxes, chests or caskets, to be decorated in this way with enameled side and top panels which can be riveted to a plain foundation. The rivets should be made definitely a part of the design, whether the box is simple or elaborate. Other suggestions given in this article should inspire the instructor or beginner to plan most interesting problems with new treatments.

The Industrial Trip

Stanley S. Radford

Arthur Hill Trade School,
Saginaw, Michigan

The author describes his method of making the industrial trip an effective method for giving his students first-hand industrial information.

The industrial trip is a valuable and effective method of broadening the student outlook and helping him determine for himself, if possible, just where he can fit into the industrial employment world to the best advantage. A student who possesses a knowledge of the various kinds of jobs available in local industrial plants has a decided advantage over one who has no conception whatever of industrial work. It is easier from the standpoint of guidance to determine where the student can or will "best fit" into a particular local industrial plant when the student has been inside that plant and knows something about the various jobs, and their future possibilities.

The knowledge which the student possesses concerning a certain kind of work and his attitude toward it, are factors that cannot be overlooked in efficient or successful placement of the student in local industries. Industrial trips, therefore, are important. In addition to their value in guidance work, these trips contribute directly to the student's knowledge of machine-tool operation, shop methods, processes, and the like. Much valuable technical information may be acquired and recorded by students taking brief notes on such trips and later writing these notes into a written report. A sample report written by a student of the Trade Drafting Department is submitted as an example of what is possible for students to do in this respect.

Method of Conducting Industrial Trip

The instructor in charge of the trip makes arrangements with the principal

of the school and the factory management as to the most convenient time. He then checks as to means of transportation to insure that all arrive at the factory at the time specified.

Before leaving on the trip, the students are informed that a written report will be required and that it will be well for them to take notes on outstanding features of interest, special machines, and the like, observed in each department visited. The instructor passes out a typed outline which the students are to follow in writing the trip reports later. The outline used by all the students is submitted below as an aid to other instructors who may be interested in conducting industrial trips in this manner.

Outline for Written Report of Industrial Trip

I. Introduction
- A. Group making trip
  1. Number of students and teacher in charge
  2. Time and place of factory visited
- B. Purpose
  1. To gain some knowledge as to the kinds of work being done in the various departments of the factory visited
  2. To gain practical shop knowledge by observation of shop processes and methods

II. Description
- A. Department No. 1
  1. Describe items or shop processes of most interest
- B. Department No. 2
  1. Same as under A
- C. Department No. 3
  1. Same as under A

III. Conclusions
- A. Most interesting features
- B. Value of the trip

Method of Writing the Report

The next two class periods after the trip are spent in helping students write their reports. After that, students may be allowed a week or two weeks to get the report finished and submitted for correction and grading. A definite date for this must be set. The sample report which follows was written by an eleventh-grade student and was selected by the plant executive as being the best report out of all those turned in by students making the trip. The contents of this report have been carefully checked and approved by several industrial executives in the plant visited.

AN INDUSTRIAL TRIP TO BAKER PERKINS, INC.

By Raymond Kawiecki, 11th Grade, Trade Drafting Department, Arthur Hill Trade School, Saginaw, Michigan

A group of students of the Arthur Hill Trade School drafting classes visited the Baker Perkins plant on the afternoon of Friday, May 10. There were thirty-two students in charge of Mr. Radford, instructor of the drafting classes.

The purpose of the trip was to gain knowledge as to the kinds of work being done in the various departments of the factory, and also to gain practical knowledge by observation of shop processes and methods.

At the plant, the group was divided into three smaller groups, each under the direction of a guide.

The first building visited consisted of the following departments: patternmaking, engraving, confectionery machinery, gas-oven equipment, and stockroom.

Patternmaking

The pattern shop, besides being well lighted, also is well ventilated. We observed a number of workmen making core boxes and patterns for the foundry, and also a number of machines in operation. A special sanding machine in which the spindle traveled up and down as well as rotated was called to our attention.

Engraving

The engraving room is adjacent to the patternmaking room. We observed a workman carefully tracing a letter on a master plate, while a needle following his exact movements engraved the letter on a brass roll which was to be engraved. This roll is used to make impressions on cookies.

Confectionery Machinery

In this department, machines for mixing candy are assembled. There are also machines used for forming candy into different shapes.

Gas-Oven Equipment

Large gas ovens for baking bread are assembled in this department. Workmen could be seen welding a number of small tubular burners on a long pipe. Each burner unit is operated by a valve.

Besides the bread-baking machine, there is also a "divider" machine, a "rounder" machine, and "proofer" machine.

The dough is weighed or cut into loaf sizes in the divider and rounded into shape in the rounder. It is then allowed to raise in the proofer, which is simply an endless conveyor, usually of the bucket or tray type, which carries the loaves the desired time for proofing, and then discharges them.

The cycle of operations in making bread is as follows:

1. The dough is mixed in a mixer in the dough-mixing room and then dumped into dough troughs for a period of fermentation.
2. The dough is passed through the divider for cutting and weighing loaves.
3. The loaves are then put through a rounder for forming and putting a "skin" on them.
4. The loaves are next put through a "dry-proofer" for initial proofing.
5. They are then put through a "molder" for a second working of the dough.
6. They then go to the steam or heated proofer for final raising or proofing.
7. The loaves are then ready to go to the ovens for baking.
8. After baking, they are put in a "cooler," which may be either a conveyor or rack system.
9. Finally, the loaves are put through the "slicer" and "wrapped" after which they are ready for the retail trade.

Stockroom

The stockroom is a large room with shelves where anything needed can be obtained. An overhead crane transports the heavy pieces of stock.

There also is a stockroom for electrical equipment, from which necessary parts may be requisitioned as needed.

Foundry

The second building visited consisted of the foundry department. Friday, at the foundry department, was pouring day, and we observed the pouring of a number of small and large molds. The large molds are poured from a huge ladle carried by an overhead crane. Two men, one on each side of the ladle, did the pouring. The smaller molds were poured from small ladles carried by the men.

In the core department, we observed a large number of cores on shelves ready to be baked. The baking is done in a large oven at 450 deg. F., and it takes from two to three hours depending upon the size of the core.

The center of the large cores is filled with either coke or cinders. There are several purposes in doing this, namely:

1. The filling of the center of the core with cinders saves molding sand.
2. There is less gas collected and it is easier to remove the gas when casting, as the core is more porous.
3. The core is more compressible, allowing it to crush and take care of the shrinkage of the iron when cooling.
4. The core bakes quicker and lessens the chance of cracking, which often happens when a solid core is baked for a longer period.

Besides the cupola, there is an electric furnace, sand-slinging machine, and sand-blasting machine.

The electric furnace is used to refine the iron. Higher temperatures can be obtained by use of this furnace. This iron is used for castings which have thin sections.

The electric furnace has two carbon rods about 3½ in. in diameter, which go into the furnace at each end. The rods do not touch each other but are set apart. When electricity is sent through these rods the electricity jumps the gap from one to

the other, and generates an intense heat, which melts the iron.

The sand-slinging machine is operated on a track down the center of the room. This machine not only delivers molding sand to the molders as needed, but actually mechanically rams the molds. The sand is thrown into the mold at such a high velocity that it is packed sufficiently to maintain its shape after the pattern has been withdrawn. The molten metal is then poured into the mold. The sand-slinging machine delivers the sand on either side of the track at the rate of three tons per hour.

We were also shown a sand-blasting machine which is used to blow the sand and scale off the castings as they come from the molds.

The third building visited consisted of the following departments: Machine shop, drafting, tracing, blueprinting, and filing departments.

Machine Shop

The machine shop is where the castings from the foundry are machined. We observed a large, heavy-duty planer with a 50-ft. bed finishing a large casting. These heavy castings are transported from one machine to another by an overhead crane.

We also observed a heavy-duty lathe machining a large steel mixer for the Ford Motor Car Company.

The plant also has a disk cut-off saw which can cut through a piece of stock, 3 in. in diameter, in about 30 seconds. This machine was made in Germany. The disk is made of the hardest steel which can be obtained.

In the toolroom there is a machine with which one can drill a hole accurately to .00025 of an inch. It can also be used to check the accuracy of drilled holes.

Drafting Department

This department employs approximately 60 draftsmen. Three rooms are needed for all of them. Each room is under the direction of a chief draftsman. Under the chief draftsman come a number of squad leaders. Each squad leader has several draftsmen under him.

The drawings are made directly on vellum tracing paper in pencil. Blueprints are made from pencil tracings. Most of the drawing work is done on sheets 24 by 36 in. and 18 by 24 in. The machines designed are usually quite large, and it is advisable to use as large scale as possible in drawing them.

As the work is completed by a draftsman it is taken to a checker, who checks it for mistakes before allowing it to go to the blueprinting department.

The power of careful observation, the ability to visualize, accuracy in layout and dimensioning of drawings, plus a knowledge of shop machine-tool operation and shop methods, are the essential requirements for draftsmen.

The three drafting rooms are: experimental department, machine assembly and detailing department, and the chemical machinery drafting department.

Blueprinting

The tracings, after they are checked, are sent to the blueprinting department. The blueprinting machine is a horizontal type with three carbon arc lamps. When the prints are washed, they go through a drier and come out ready for use in the shop or drawing room.

Blueprint Filing

The blueprints are filed systematically in a blueprint-filing department which is located centrally in the machine-shop building. The purpose is to give to the workmen any blueprint they ask for at the time it is needed.

Tracing Filing

This room is adjacent to the blueprint room. Here all the tracings are filed systematically. This room is large with a great number of cabinets. Some of the very first tracings made for the company are still on file in this department.

Automatic Buzzer System

The purpose of this system is to reach any superintendent or foreman in any part of the plant. The person wishing to talk to a superintendent goes to a telephone and dials the superintendent's number. This automatically sounds a buzzer (each superintendent has a different buzzer code call) all over the shop. The superintendent hears the buzzer, goes to a telephone and dials his own number. This automatically gets him in touch with the person who wishes to speak to him.

Conclusions

A trip of this type is beneficial in that it gives an idea of the various kinds of industrial work and methods and it helps considerably in determining the kind of job one would be interested in obtaining with that company.

The work I would be interested in obtaining would be in the line of drafting because I like that work best.

Aside from the value to the student in increasing his industrial knowledge and the possibilities as to better guidance and placement, the industrial-trip report presents a splendid opportunity for the student to make a practical application of descriptive English. The ability to describe the mechanical operations of a machine or a shop process is valuable to any draftsman or shop worker.

Publication of student reports by local newspapers, industrial-plant organs, and educational magazines provides a strong incentive for students to take an interest in making written reports of trips each year.

These reports also provide a direct contact between the students and the plant management. Industrial executives, after examining the written reports of various students, are able to judge for themselves as to the interest and abilities of the individual, thus helping students to get recognition, and probably employment.

Organizing Printshop Production

R. Randolph Karch
Arsenal Junior High School,
Pittsburgh, Pennsylvania

Whether production work should be a part of the junior- or senior-high-school printshop course or not, here is a way of taking care of it, if it must be included.

It is not the purpose of this article to take sides in the controversy on whether or not production should be carried on in junior- and senior-high-school printing departments. Most teachers of this subject agree that production should be controlled by the instructor, and kept to the minimum for instructional purposes. However, let this paragraph suffice to consider the facts: Most departments have production, and many have, or think they have, more than they can do. Also, some instructors have been at their wit's end trying to keep up suitable instruction with a burden of production.

The suggestions in this article are given to help the instructor to organize his classes so that he can produce the printed matter required of him, and at the same time carry on an instructional program for the pupils who do not or cannot handle production work. These suggestions are workable — they have been tried out and have been found suc-

cessful. Perhaps the ideas given here will not be new to some readers, but it is believed that the new man in a printing teaching position will benefit considerably from them if he carries them out.

Staggered Schedules. An instructor complained bitterly about the following schedule: He had two ninth-grade classes and five eighth-grade classes daily. He said: "I can operate my presses only two periods a day, when the ninth grade comes, as the eighth graders do not come often enough to enable me to put them on presses. Consequently the production piles up."

The solution to this man's dilemma was simply to stagger a portion of his ninth-grade enrollment over the seven periods of the day. This enabled him to operate his presses every period of the day if necessary. He soon caught up with his production, and seldom fell behind again.

It may be difficult for some instructors to carry out this plan, especially in a school with just a few ninth-grade classes. He may also have difficulty with the administration in attempting to change a boy's schedule, as principals are sometimes loathe to do this. However, if he presents his case well, and follows through with convincing arguments for his plan, he can be successful.

Copy Cutting. The printing teacher can take a lesson from the daily newspaper practice of cutting copy into several sections, or into paragraphs, and dividing it among members of the class for composition. Not only can straight matter be handled in this way, but also job printing, such as programs, letterheads, and the like.

Starting a Job. Left alone, a pupil will often take the long way round in setting a job. On rush work, five minute's time of the instructor may be economically used in starting a difficult job of composition for the boy compositor. This is especially helpful in the case of multiple justification work and tabular forms. Rule-form make-up can be started in a galley in the same manner.

Doubling the Stock Size. Instructors sometimes fall into the habit of doing presswork in the same way year after year. One instance of this is of the man who had many jobs of 3 by 5-in. cards to print. They were small runs, so he set them one-up, and ran them on the 3 by 5-in. size. The margins were small, and added to the difficulty of feeding a small sheet into the press. He changed his plan, and saved much press time in cutting the stock double, or in the 5 by 6-in. size. The feeder then ran the job one-up on the right side of the card, from one form, using the left side of the card for "grabbing room" in feeding, doing away with the sandpaper finger tips used to save the job from being smeared. Consequently, much time was saved on press runs, as the boy could feed the larger sheet faster in perfect safety, with no fear of smearing the job. With dryer in the ink, the card could be immediately flopped and run on the other end of the card, as soon as one half of the job was run. If minutes saved in the commercial shop mean money, what does it mean in the school shop?

The Incompleted Work Board. The writer has found an incompleted work board invaluable in storing partially set newspaper copy until the next class arrives that completes the setting. It consists of a board about the size of a California job case, set up at an angle of about 45 deg. like a bank, and partitioned off with small sticks, nailed on, to accommodate sixteen composing sticks. Each stick is numbered, and a corresponding number is stenciled in white ink on the board, which is painted black. At the close of the period, each pupil proofs his job, places this proof in his portfolio, and then puts the stick in its respective place until he or another pupil comes into complete the work. This scheme is advantageous for the following reasons: Each pupil may work up to the clean-up time. It is not necessary for him to ask, "Do I have time to start another job?" — as he can start one even if he sets only part of a line. This saving of time gets production out with rapidity, especially in the case of newspaper composition. Furthermore, the scheme keeps even partially composed lines from falling over and pi-ing when stored away.

The After-School Club Period. One instructor finds an after-school club period a boon in getting out production. In this particular school, the pupils are excused some forty minutes before the teachers may leave. The purpose of this organization is to finish incompleted work left over at the end of the day, and to organize and lay out work for the next day. The club is quite popular, and has a waiting list to join.

Small Hand Presses. The use of small hand presses often releases the larger power presses from project work, which can then be utilized for necessary long-run production work. A good 6 by 9-in. hand-lever printing press can be purchased at a cost of from $40 to $80, and as much as 90 per cent of all project work may be planned to fit this size press. Inasmuch as projects are not usually long runs, it is no hardship to operate the small hand lever. These small presses can be used in the lower grades, for they can be mounted low for the small-statured pupils, and there is little danger of the beginner injuring himself.

An Instructional Job Order Envelope may aid materially in turning out printed matter with dispatch. Usually such an envelope contains copy and a few remarks such as how many are wanted, the size, and kind of stock. If a layout is furnished with the copy, and full particulars on how to compose and print the job are enclosed, work is speeded considerably.

The Foremen idea is a boon to the instructor in freeing him from some of the detail work in instruction which some trained boys can do well. In addition to this relief, the foremen's education is materially increased — "If you want to learn a thing well, teach it." An article on the foremen's club idea appeared in the January, 1935, number of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

Vocational Students in the Junior and Senior High School. About the best plan, in the writer's opinion, to handle a steady flow of demanded production is in establishing a vocational class in the junior or the senior high school. Necessarily, the size of the class must be limited to not more than 6 students in all, as the printshops are usually found crowded with regular classes. Under a plan now in operation, six vocational students are sent to a junior high school alternately; that is, three remain in the trade school for academic courses for a week, all day, and the others are in shop all day for the same time. On the second week they alternate. The advantages of this idea are apparent. Three highly trained and hand-picked boys are invaluable in the production department for an all-day period.

This scheme is feasible whether or not printing is taught in the trade school involved. Academic courses can be made to fit into the scheme at the trade school for the few printing students. Where the trade school has a printing department, there is frequently an overflow in the department on registration day. This overflow could well be handled at the junior or senior high school. Furthermore, usually more students can be handled in the related-subjects rooms than in the shop, which makes it possible for the lower-grade school to handle this overflow.

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

J. J. Metz, Editor

A Memorable Anniversary

On May 1 and 2, 1936, the friends of vocational education in Wisconsin celebrated the twenty-fifth anniversary of the passage of the continuation-school (now called vocational school) law in their state.

It is well on anniversaries of this kind to review the origin, and to study the progress of the movement under consideration. In the case of vocational education in Wisconsin, such a study is both interesting and enlightening.

It was in 1909 when Mr. C. P. Cary, the state superintendent of schools, secured the introduction of a resolution to appoint a commission which was to study the question of establishing this type of education in Wisconsin, and to report on their findings at the next legislative session. The commission was appointed and Dr. Charles McCarthy, its secretary, later wrote the report which was unanimously adopted. He also wrote the bill which was introduced and passed in the 1911 legislative session.

In order to get the plan started, Mr. Warren E. Hicks, assistant to the state superintendent, was appointed as organizer and supervisor of the schools then known as continuation schools. Mr. Hicks served in this capacity from 1911 to 1917. Slowly the work got under way, but as it grew, it gathered momentum, and at the end of six years there were 31 of these schools, all striving for the goal set for them by the pioneers who had fought for and established them.

In 1917, the administrative powers were lodged with the state board of vocational education, and Mr. Frank Glynn, was appointed state director of vocational education. After he left, Mr. Geo. P. Hambrecht, the present incumbent of that office, was appointed.

Many other changes have come about, since the part-time school law was first enacted. Originally, for instance, a pupil of the elementary school, who had arrived at the age of fourteen years, and had finished the fifth grade, could leave school and obtain a work permit. The law then required him to attend the continuation school four hours a week until he arrived at the age of sixteen. In 1921, this was changed to a provision that the pupils could no longer leave the elementary school at the age of fourteen unless they had finished the eighth grade, or had attended nine years beyond the kindergarten. The law also stipulated that all who were not graduates of a four-year high school had to attend half time until they were sixteen, and then, one day per week until they arrived at the age of eighteen.

The rise of unemployment during the last five years made it appear at first as though the vocational school would soon be unnecessary as it was expected that most students would choose to remain in the full-time schools. As a matter of fact, the high schools have found that many more graduates of the elementary and junior high school do continue in the full-time high school, than ever before. The defections brought about by unemployment conditions among the young of vocational-school-attendance age, however, have been more than made up by the voluntary enrollment of unemployed adults, with the result that the vocational-school attendance shows a splendid growth from year to year.

Vocational educators such as Cooley, Graham, Rees, Coleman, Heilig, Randall, and others, have during all these years successfully defended the rights of the youth of Wisconsin to vocational exploration, training, and guidance for which the part-time school was instituted; against the intrigues and efforts of unscrupulous politicians, business men and industrialists. It is due to their work that Wisconsin can be proud of what has been accomplished by its part-time schools up to the present time.

With such men at the helm, it is but reasonable to predict continued growth for the future of the Wisconsin vocational school.

A Plan That Deserves Study

A master carpenter's association of a large midwestern city, recognizing the dearth of skilled carpenters at the present time, proposes a new scheme of apprenticeship whereby the apprentices are indentured, not to an individual employer, but to the association.

A study of the building trades in that city showed that there had been no carpentry apprentices indentured during the past five years, and that, due to deaths and other causes, the average journeyman's age had risen to fifty-four years. Five years ago, this average age was forty-five. Of course, under present conditions, there are still many journeymen carpenters unemployed, yet should the building activity increase as much as it is definitely expected to do during the next few years, the lack of trained workers would be acutely felt.

Under the proposed new plan, the apprentice will be rotated among the members of the master carpenters' association, giving him not only steady employment, but a much wider opportunity for obtaining trade experiences under varying conditions. The term of apprenticeship will embrace 5,800 hours of trade training, with 400 additional hours of attendance at a vocational school for special training.

The proposed plan has been favorably commented upon by members of other building-trades associations and by local union officials. As outlined, it seems to offer several advantages to the young men who will enter the trade under its provisions, and teachers of apprentices should not fail to study its possibilities, and to inform their local employers of carpenter apprentices as well as of apprentices in other trades, of the results of their investigations.

A Study of Industry

In their summer perambulations, many industrial-arts teachers wisely visit industrial shops as often as possible.

It is well to remember when making such a visit, not to suggest to the shopman who is conducting one through the shop, how the shop or some of the manufacturing processes could be improved. The shopman no doubt knows the shortcomings of his plant and yet may be unable to do anything about it.

Vocational Automotive Electricity

Arthur Krogstie

Boys' Vocational High School, Minneapolis, Minnesota

An outline which may be found useful either by adoption or by imitation.

Automotive electricity is closely related to auto mechanics as it is taught in vocational and industrial-education classes. At the Boys' Vocational School in Minneapolis every attempt is made to unify these subjects and, therefore, a time, usually one semester of four 45-minute periods each day for eighteen weeks is set aside for this subject.

The course outline used in our work is shown in the accompanying diagram. It is hoped that it will prove helpful to other teachers in similar situations. The method of charting will lend itself to subjects other than automotive electricity, merely through rearrangement of sectors, shop knowledge, jobs, and time. An achievement chart is used with this outline.

A class of beginners in automotive electricity must learn the fundamentals of electricity in just as thorough a manner as would a class beginning a course leading to trade practice in electricity. As shown in the chart the phases of the subject are in a logical sequence. In the first sector, three weeks are sufficient to teach the prospective auto mechanic the shop knowledge and skill necessary for completion of jobs 1 to 11, inclusive. These call for a practical application of the fundamentals and related shop knowledge. This block would be extended if we were thinking in terms of manufacture rather than of service and operation. Battery charging in all of its phases is covered. Series versus parallel charging is fully covered in the study and operation of rectifiers and constant-potential chargers. Charging batteries involves many fundamentals, namely series — parallel connections, polarity, chemical action on charge and discharge, specific gravity, voltage, amperes, capacity, quality, and efficiency. Manufacture of batteries and their care varies according to the locality of use, as to warm or cold climates.

The shop layout, equipment, and materials for the auto electrical department need not be elaborate. We have limited our equipment to the bare necessities, as follows: 1 bulb type series charger, 1 motor generator constant-potential charger, 1 large combination lead-lined sink and workbench, 1 lead burning outfit, battery voltmeters, hydrometer breakdown test meter, and connecting jumper clips. Used batteries are purchased for 50 cents each and they are good enough for experimental and practice purposes.

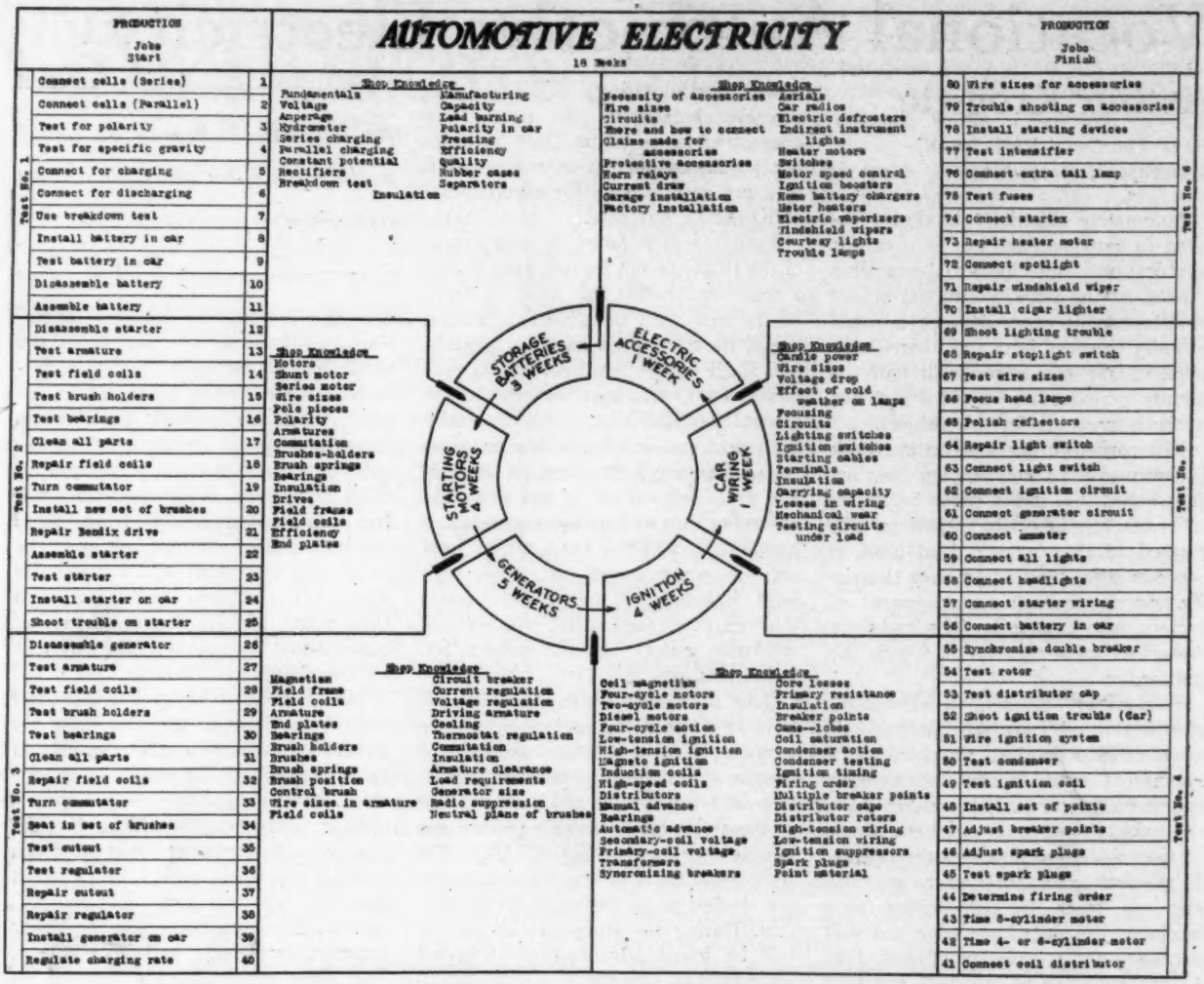
Each boy is required to take charge of the battery room for one week during a semester. During this week he keeps all records such as a service station would do on owner's batteries, rentals, etc. Each boy is required also to take charge for a week each semester of the general toolroom that serves the entire auto electrical department. In this toolroom there are a complete set of open end wrenches, one set of box wrenches, one set of thin wall socket wrenches and handles. In addition there are at least six 3-in. screw drivers, six ¾-lb. ball-peen hammers, 1 punch set, center punches, pinch bars, spark-plug sockets, thickness gauges, ignition wrench set, lathe tools, etc.

Jobs numbered 12 to 25, inclusive, have to do with the service of starting motors. Here, also, fundamentals of electric motors must be covered step by step and finally the application made of the series motor serving to turn the internal combustion engine. All of the component parts of the starting motor are studied as to design and construction. During the study of this unit it will be found advantageous to spend some time on conversion of chemical to electrical energy and on conversion of electrical to mechanical energy which includes a thorough study of all starter drives. The equipment, tools, and material for these jobs are individual workbenches, one electrical test bench (Widenhoff Service Station type), general tools, and 20 old starting motors bought from an automobile junk dealer for about $2.50 each. These old motors last about two semesters. Lathe operation is involved on these jobs in turning armature commutators.

Jobs numbered 26 to 40, inclusive, relate to the service of automobile generators of all types. The fundamentals of electrical generation are studied here. We cover purposes of generators, design and operation, types of drives, cooling, regulation, bearings, and all other necessary phases. The same tools, equipment, benches, and test bench are used for these jobs as are used for starting motors. All jobs are given a running test when work is completed; this is necessary because the combined operations constitute an overhauling of the unit. We obtain from the manufacturers of automotive electrical equipment, most of the latest specification charts and instruction sheets. This enables us to keep up-to-date on car electrical equipment. While there is much free material available from these sources some of the manuals must be purchased. Old generators for practice jobs can be purchased for about $3 each with prices slightly higher for newer types. About 20 generators are sufficient for two semesters.

Jobs numbered 41 to 55, inclusive, pertain to ignition. At this time the writer would like to call attention to the sequence of the subjects on the chart. At the beginning, simple fundamentals, and gradually working into the more complex problems. This order has made it possible for boys of 15 to 18 years of age to learn this subject, whereas by mixing this order, the writer believes less results will be obtained. The practical application of ignition must approach perfection and the student needs to know what he is doing. Shop knowledge is covered thoroughly, the practice jobs are completed, and the boy then applies his knowledge to a running car in the school garage. From this point, experience is gained by working on live cars brought into the garage. A high standard of workmanship must be attained on all electrical jobs. In earlier parts of the course, written and oral tests would suffice, but in these later and more exact phases the instructor uses practical jobs for better proof of the student's progress. The running test of an engine proves the ignition system and timing as good or bad. In this work we conform as closely as possible to the specification and data sheets available about the different makes of cars.

Jobs 56 to 69, inclusive, relate to car wiring, lights, etc. Two old car chassis are used for practice in wiring starter, generator, lights, ignition, and other ac-



cessories. Focusing of headlamps is also practiced on these old cars, and a regulation chart is made use of as in commercial shops. We adjust to conform to local and state ordinances. Circuits are studied and tested, and the student continues this type of supervised practice until he becomes proficient. He is then allowed to do wiring jobs on customer's cars in the garage, and develops an appreciation for work of high quality by working under actual running conditions. Types of wire and wire sizes are studied, excellent informational material having been obtained from several wire manufacturers.

Jobs 70 to 80, inclusive, relate to electrical accessories of the automobile. We instruct in the reasons for them, and the *how* and *why* of their installation. Much information useful in this work is found in the catalogs and instruction sheets which accompany these accessories. Servicing and installation practice is variable so that much studying is necessary in order to keep up-to-date in this phase of our work. And last, but not least, we offer instruction in automobile radio. We manage to install and service a considerable number of radio sets in all makes of cars, and we find this phase of the work increases regularly.

All in all, automotive electricity is a very interesting subject to teach, as well as a necessary one. Any school contemplating the addition of an auto electrical department should consider such a course. It will be found to be one of comparatively low per-pupil cost because much of the needed equipment is already available. One of the secrets of success is close co-operation with the instructor of the mechanical phases of auto repair.

A Profile-Type Rating Card

F. C. Finsterbach
Elementary School No. 19, Buffalo, New York

A graphic representation which helps students and parents to visualize a given trade.

The grading of students in industrial-arts work is a matter that should be given more critical attention than practice seems to indicate. Whether we like it or not, school authorities, parents, and custom demand some sort of grading showing the level of accomplishment in all branches of educational endeavor. That we are not called upon to

justify more often the basis of our so-called marks is due either to a beneficent Providence or the usual complacency of the American public.

While opinions might vary as to the need and efficacy of school marks, aside from the accuracy, the teacher will and probably must continue to use them in one form or another until something more satisfactory is evolved. The card herein discussed assumes compliance with existing grading systems but suggests changes in form to show more clearly and on a broad basis the results determined by whatever measuring devices are used.

The card is intended for use in the laboratory of industries but nothing prevents its adaptation to the unit shop. It may summarize visible progress or operation charts and like devices. Its construction is based on the premise that whatever it indicates must be interpreted as a *tendency* or a *trend* and that a low negative grade is just as valuable as a high grade in industrial arts if *guidance* continues to be one of our objectives.

The first element is in the consideration of *fields* or *activities* rather than projects or processes *per se*. The boy is assigned to work or to explore an industrial activity and a diagonal line is drawn in the *numbered* column opposite the activity, as:

Activity	1
Ceramics	/

When a given number of operations are completed, or a project made, or an arbitrary unit of time elapses, the proficiency of the boy in *that* activity is symbolized by a dot (.) placed in either the low, medium, or high column, as

Activity	1	Low	Med.	High
Ceramics	/		.	

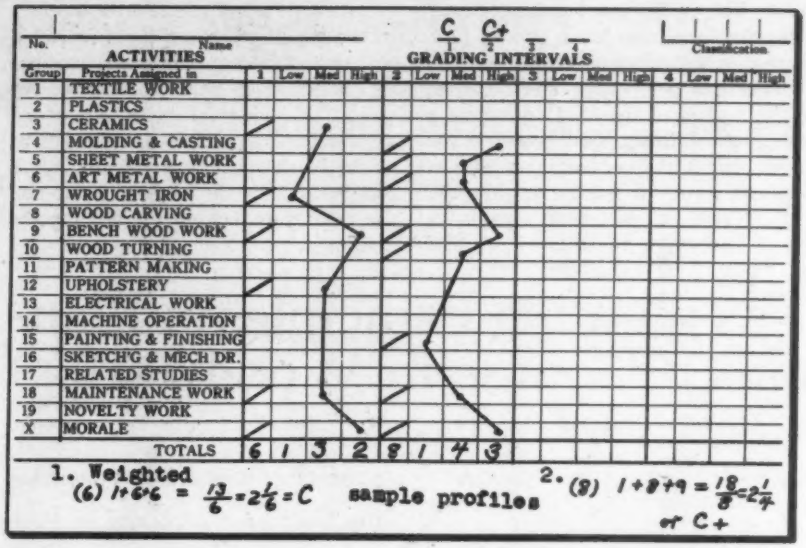
the location of the dot determined by information tests and/or performance tests and/or subjective judgment of the instructor or a combination of all. A project "finished" is shown thus,

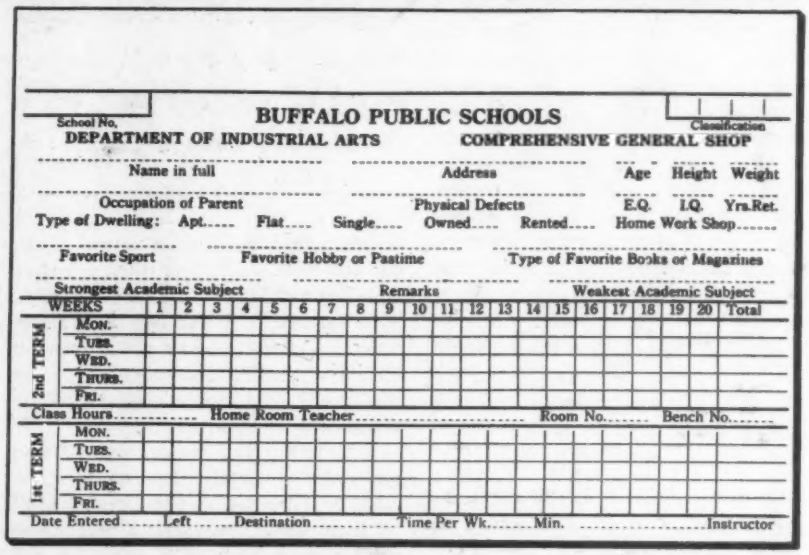
	1
Ceramics	/

a line crossing the assignment diagonal.

The boy then is assigned to another activity and another and his accomplishment indicated in the low, medium or high column. When the marking interval closes, the dots are connected by straight lines and the resulting graph is the "profile" of accomplishment.

The summation of each column (counting the dots) gives a total that reads in four figures, as for example:





Upper. *The profile grading card. Actual size 4 by 6 in.* — Lower. *Reverse of card showing general information and attendance*

6 3 1 2, the six indicating activities engaged in, with *three* low ratings, *one* medium and *two* high.

The ratings are then "weighed" by allowing 1 point for low, 2 for medium, and 3 for high. The above score, 6 3 1 2 when weighted would read (6) 3 2 6. The next step is to *add* the weighted figures, which in this case will be 11. This eleven or sum, divided by the number of activities (6) will amount to 1 5/6 or a net rating somewhere between *Low* and *Medium*. Results similarly obtained for the whole class will, when arranged according to size, show the *relative place in class* for each member.

No attempt is made to interpret the relative place in terms of per cent for the report card to parents. Letter grades may be given, however, but the basis is purely subjective. The following divisions are suggested as a basis: 3-A; (high) 2½-B; 2-C; 1½-D; 1-E; No (F) or complete failure need be included.

The advantages of such a card are many. It is complete in itself and can be filed as a permanent record. It provides for differences as to assignments, speed, and accomplishment. By including estimates in *Maintenance* and *Morale* these elements are given full consideration as an integral bit rather than as a thing apart. The weighting of results points out a way for improvement and gives the slower worker equal opportunity to compare with the

faster. The profile is a handy reference that backs up the letter grades sent home with something solid and less disputable than percentages and the like.

The reverse of the card represents a collection of items that ought to be known about the student arranged to eliminate as much writing as possible. This includes a forty-week attendance space. The writer has made it a point to anticipate all of the regular holidays on the record when the cards are filled out and of noting other interruptions that occur which have the effect of absence. This gives more or less of an "available time profile" that is valuable.

The blank space at the top makes it possible to ring the cards together and use both sides readily by flipping the card over.

The Guiding Principles in Planning a Course in Woodwork

Sam M. Ford

East Texas State Teachers College, Commerce, Texas

It seems almost trite to mention objectives as a necessity in planning any educational course, yet how necessary are both the reference to them and their use in curriculum planning.

One of the most profitable things a teacher can do is to ask himself the question, "What do I expect my pupils to be, to know, and to be able to do at the end of the year, as a result of their experience and my teaching in my subject?" This question must then be answered in an unbiased way, unencumbered by any speculative theories or fanciful hopes. It is of no particular value to state the answer in terms of "general objectives" or in indefinite or high-sounding terms. If the answer is to have any value, it must be in terms so simple, so definite, and so exact that every pupil may understand them readily. Such a statement supplies definite goals, and when a student knows exactly what he is expected to do, he is much more likely to do it than when the requirements are hazy and indefinite. This applies to every subject in school.

To write out such a list of objectives is a difficult task, but unless one can put down what is expected of the pupils when they have finished their period of training, the chances are the teaching will be indefinite and uncertain. In shopwork it is very likely to result in simply making things. The list need not be complete in the beginning, but it should be made as nearly complete as possible, and as each new item is determined, it should be added to the list. In this manner, the list soon becomes quite complete. Sometimes an item may have been included which is found to be beyond the scope of the course. In this case it should be struck from the list.

Not knowing the answer to the question "What is your aim in your course?" seriously endangers the future of industrial arts and vocational education. It is, therefore, advisable that shop teachers do some clear thinking in regard to the aims of their work. Too often a course is laid out and later a statement of aims is formulated to fit the course. What is needed, however, is, first, a statement of objectives, and then planning of a course which will contribute definitely to the attainment of these aims.

Frequently, the young teacher who undertakes to study the various statements of objectives is soon bewildered by their variety, vagueness, and multiplicity. In such a case, it might be well to think of the objectives of industrial arts and vocational education under several heads. In the first place, this type of work must contribute to the general objectives of public education, such as the development of citizenship, sound social attitudes, character, etc. In the second place, there are the general values or objectives which one may reasonably expect to be attained as a result of well-organized and carefully taught shop and drawing courses. Under this head may be: appreciation of the significance of modern industry; a deeper interest in production, materials, and skillful work; the development of initiative in situations demanding manipulative skill and technical knowledge; and the development of constructive tendencies in boys. Both these types of objectives belong to the philosophy of, and are fundamental to, the successful planning and organization of industrial arts and vocational education. But these are general and it is almost impossible at any time, in any individual case, to determine whether or not they have been realized, or just to what extent progress has been made toward their realization. Therefore, for the very practical purposes of planning a course of study, buying and arranging equipment, and organizing the details of shop and drawing work, it is necessary to set up very specific, immediate aims for that work. These aims may be regarded as means by which we hope to realize the larger and more general objectives.

Shop teachers who have a clear vision of the values and possibilities of their work, and are taking full advantage of the great store of educative material to be found in a broadly and carefully organized course, are not likely to have their work curtailed. With the urgent call for economy and for reduction in public expenditures, school boards are eliminating and reducing those departments of work and activity which cannot prove the necessity of importance of its continuance. Therefore, the problem is not primarily that of making a verbal defense of industrial education in the schools, but that of strengthening and enriching the courses. The solution of this problem lies almost wholly in the hands of the teachers. If the shop teachers in the high schools and junior high schools will but realize the present situation, and use all their power and knowledge to build up their courses, they can make a larger contribution to the development of this work than has been possible during the past ten years.

It is necessary then (1) to think carefully through the general objectives of public education, (2) to formulate the general values to be reasonably expected from a good rich course in industrial arts or vocational education, then (3) to state clearly a few definite immediate aims of the courses to be given, such aims to contribute definitely toward the realization of the general values and to be such that progress can be measured.

Then there is the problem of working out projects. It will be clear to any teacher that if the pupil is furnished with such plans worked out in detail that do not call on his initiative, some planning, and thinking on his part before he can proceed with the building of the project, the student is not getting one of the most valuable lessons which industrial arts and vocational education should furnish him. Pupils must be required to make plans of their own. The

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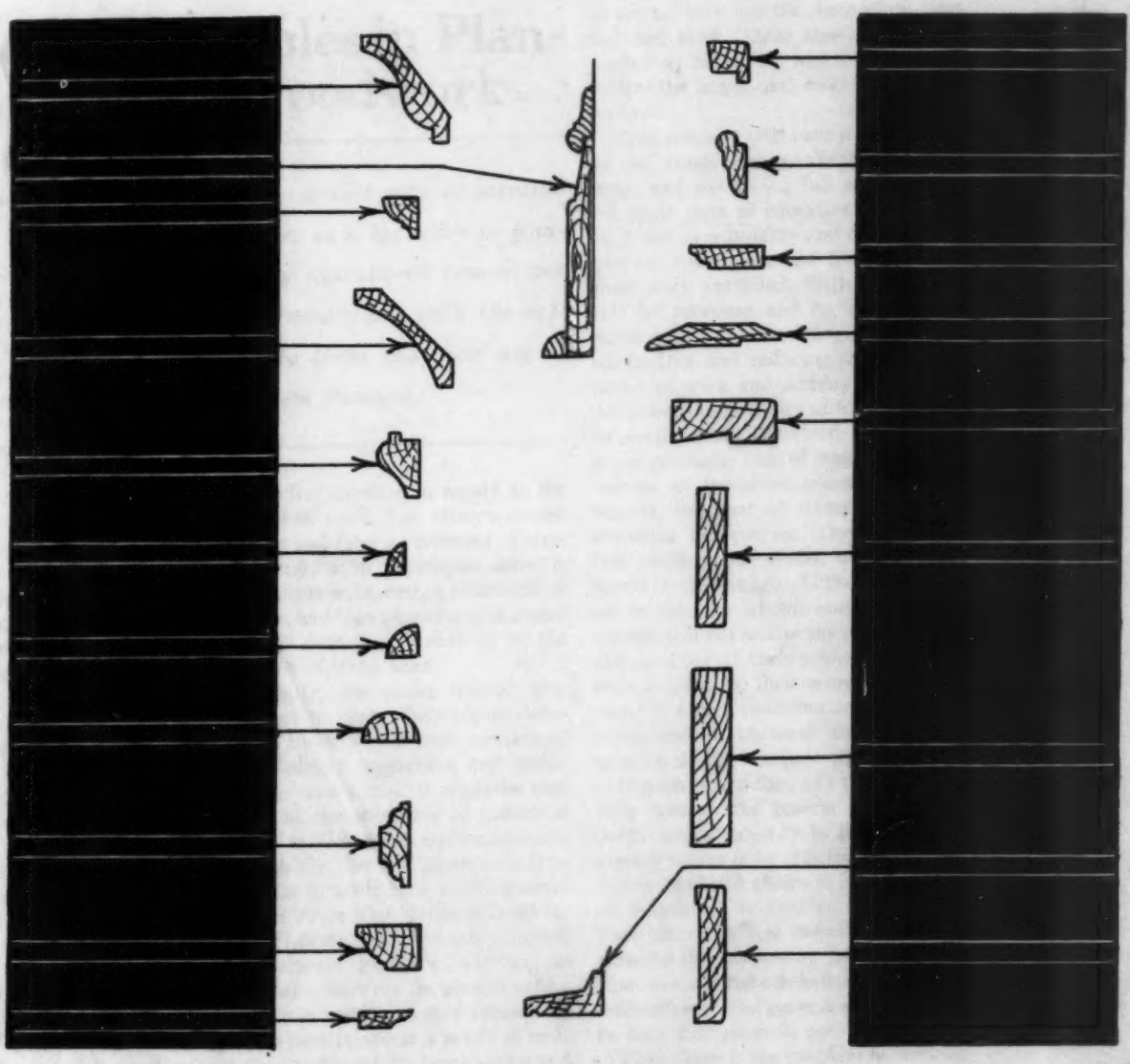
ARCHITECTURAL DRAWING

TEST NO.7

STUDENTS ARE TO FILL IN THE NAME OF EACH OF THE MOLDINGS SHOWN IN SECTION BELOW. YOU WILL BE GRADED ON NEATNESS, LETTERING AND ACCURACY.



STUDENT'S NAME

Submitted by Ren Aton, Michigan City, Indiana

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ARCHITECTURAL DRAWING
TEST NO 7
SCORING SHEET
TO SCORE LAY OVER STUDENT'S SHEET

CUT OUT

CROWN MOLDING

BASEBOARD

BED MOLDING

COVE MOLDING

PANEL MOLDING

SHOE

QUARTER ROUND

HALF ROUND

BATTEN

CAP

STOP

BACK BAND

PICTURE MOLDING

STOP

THRESHOLD

WINDOW STOOL

MULLION CASING

INSIDE JAMB

DRIP CAP

CASING

CUT OUT

Submitted by Rea Aton, Michigan City, Indiana

teacher should question the pupil about each step in the plan until he is sure the pupil knows how to proceed with the problem in detail. This planning by the pupil should never be neglected. And it is well that the teacher select the projects so that the pupil will obtain greater practice in the skills most frequently used.

In selecting projects to be worked out in the shop, it will be well to remember that they should:

1. Be simple enough to be within the capacity of the boy.
2. Be possible of completion within a short time.
3. Be easily constructed under school-shop conditions.
4. Be useful in the estimation of the boy.
5. Contain some of the principles the teacher wishes to teach.

Nothing is more important in industrial work than that the problems of the shop shall be linked with other phases of school or home life. The boy should be taught to appreciate the fact that he must thoroughly plan jobs and get them done on time. This makes him think along constructive lines and helps him to execute his plans better.

In listing the outstanding points which would be considered as guiding principles in planning a course in woodwork, attention should be given to the following:

1. Age of the pupils.
2. Local community needs.
3. Woodworking occupations represented in the community.
4. The students' previous experience in work of this nature.
5. Equipment available for teaching the course.
6. Materials available for the course.
7. General aims of the work (whether it be appreciational, finding, handy-man abilities — like household repairs, hobbies, or vocational).

Just how are shop courses to be enriched so as to realize the most use out of them? Clearly there are two methods of gaining information and experience of the desired kinds in the shop; one by performing intelligently and carefully the manual work of the shop course, and the other by attending shop talks, writing essays, studying references, using shop and other technical texts, and by visiting factories and local construction jobs. To reach these ends sought, the specific aims would be as follows: (1) To give as large a variety of experiences as possible in modern industrial processes requiring manual skill and technical information; (2) to give a large amount of technical and occupational information relating to typical modern industries, and (3) to teach the shop-work so as to develop as far as possible appreciation and initiative in the solution of constructional problems.

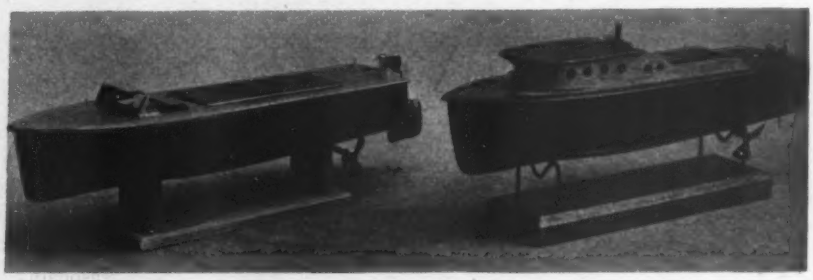
The shop teacher who has a vision of his larger opportunities will do more than keep his shop open just the required number of hours or produce just the required number of projects. He will extend his kindly services into the personal and home life of the student. He will use the schoolroom as a laboratory for working out bases for life efficiency and soul qualities so much in demand for genuine success. That type of teacher knows there is something to be taught as well as something to be made. The teacher is the motive force behind the work. Upon his preparation, upon his vision, his initiative, his insight into human nature, his character, and his willingness to work and make his department better than he found it depends the progress of programs of industrial arts and vocational education.

Problems and Projects

12-IN. OPEN-COCKPIT MOTORBOAT

J. H. Werick, School No. 21, Buffalo, New York

With the time for boat contests at hand, the motorboat described herewith will be an aid to both teacher and pupil interested in this type of project. Due to the simplicity of the design and the manner in which each step of procedure is given, it should arouse new interest in those who have given up boat building because of the trouble experienced in working with templates to the curves and irregular shapes involved. The design, aside from the modification of the hull's sides, is an exact replica of one of the fastest small boats on the Niagara River, and although a straightedge is the only thing necessary to test the side or bottom shape of the hull, it still remains a perfect displacement hydroplane. The power plant may consist of six strands of 1/32 by ⅛-in. rubber or a spring motor with a 1⅜-in. propeller. This is probably due to the slight amount of draft. The rudder assembly shown is of the simplest design and can be elaborated upon as seen fit. The type of boat can also be modified. If white pine or balsa not over 1/16 in. is used, a cruiser cabin with its roof not over ⅝ in. above the deck and starting at the front end of combing opening will work out nicely. A runabout type with windshield, instrument panel, seat and rear hatch can also be used. In this case, be sure to make the hatch cover removable so as to allow for the oiling of the motor and propeller shaft, or the replacement of rubber strands. If a larger



12-inch motorboats

Materials

1 pc. 2¼ x 3⅜ x 12½	White pine or balsa wood	Hull
1 pc. 3/32 x 3½ x 12½	White pine or balsa wood	Deck
1 pc. 2½ x 3	24-gauge commercial brass	Rudder and propeller

Tools and Supplies

Pencil	Nail set	No. 20 x ½-in. brads
Rule	6-in. dividers	No. 20 x ½-in. brass escutcheon pins
6-in. try-square	Marking gauge	Scratch awl
Crosscut handsaw	Spokeshave	Waterproof glue
Rip handsaw	Round-nose pliers	Paints or enamels
Claw hammer	10-in. half-round rasp	Shellac
Knife	8-in. mill file	Spar varnish
Jack plane	Putty and knife	No. 00, ½, 1 sandpaper
Tin snips	3 Hand screws	Thin stick or band-saw blade

boat is desired, increase the scale by inches or fractions thereof, and it still retains its original design. Increase the power plant accordingly.

Competing against power boats of all descriptions ranging up to 2 ft. in length, an exact duplicate of this model, powered with a spring motor, took second prize in the city-wide model-boat contest sponsored by the Buffalo *Evening News* last season.

Specifications: Making a 12-in. motor-boat of wood and metal construction. (This method of construction is suitable for boats up to 24 in. long.)

Purpose: A piece of handwork which will afford hours of pleasure and pastime; one which will test your skill and patience, as the wood from which it is to be made is very soft, tools easily, and must be handled much more carefully.

Hull Block

Procedure:

1. Select and cut out two pieces of clear white pine or balsa wood 1⅛ by 3⅜ by 12½ in. (It costs more and is harder to get material 2¼ in. thick in one piece.)

2. Surface-plane sapwood surface of one of the pieces smooth and perfectly flat. Chalk this surface and proceed to plane up same surface of other board. Test for glue joint by rubbing this last planed surface upon chalked one of other piece. Place a No. 18 by 1-in. brad in each end of upper piece; turn pieces up on edge, set three hand screws temporarily, and then remove.

3. Cover surfaces to be glued with an even but not too heavy coat of waterproof glue; bring these surfaces together, even up edges and drive brads in just far enough to hold firmly while clamping. Inspect glue joint and readjust clamps if necessary. Set aside to dry overnight.

4. Get out material for deck; surface-plane one side, then gauge and plane to proper thickness.

5. Remove clamps from hull block and hang them up upon rack. Surface-plane better large surface and mark "work face." Plane better narrow surface in like manner

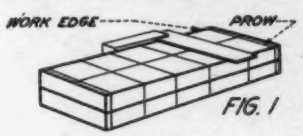


FIG. 1

and mark "work edge." Plane remaining surfaces fairly square to work face and work edge.

6. Set marking gauge to one-half width of block, and gauge center or keel line on

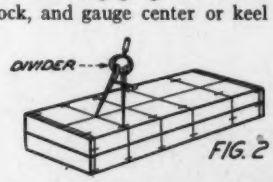


FIG. 2

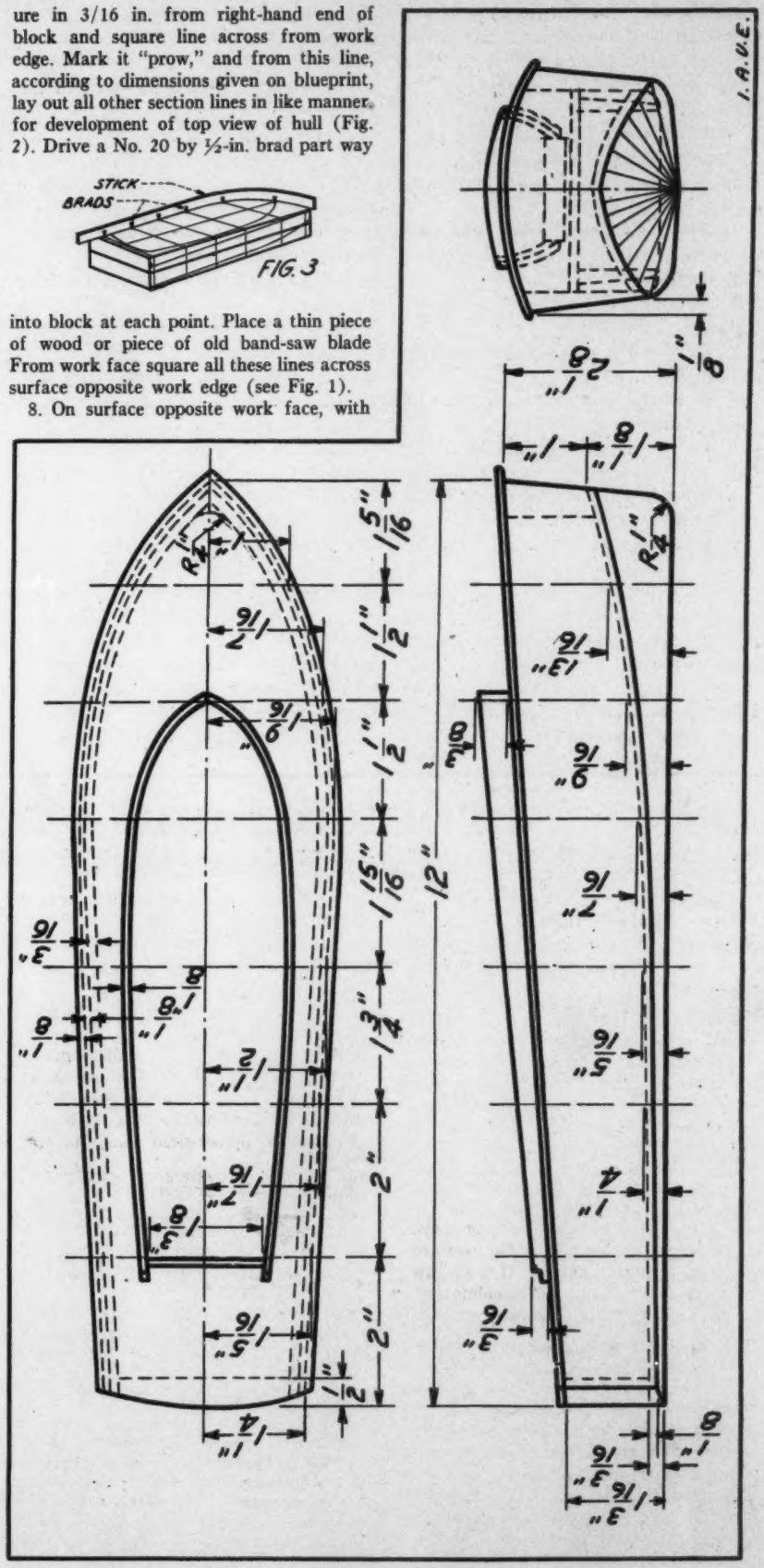
work face and surface opposite, keeping head of gauge tight against work edge.

7. On surface opposite work face, measure in 3/16 in. from right-hand end of block and square line across from work edge. Mark it "prow," and from this line, according to dimensions given on blueprint, lay out all other section lines in like manner for development of top view of hull (Fig. 2). Drive a No. 20 by ½-in. brad part way

FIG. 3

into block at each point. Place a thin piece of wood or piece of old band-saw blade From work face square all these lines across surface opposite work edge (see Fig. 1).

8. On surface opposite work face, with



a pair of dividers set according to dimensions on blueprint, lay out all section points against the outside of the brads and then draw a line along outside of blade. Set dividers to radius for rear of hull and scribe line upon block (Fig. 3).

9. On surface opposite work edge and in like manner lay out all section points for development of side view of hull and draw lines (Fig. 3).

10. Show to instructor for his approval. He will saw it out or show you how. Save top scrap piece for use when holding hull in vise.

11. Place a piece of soft ¾-in. stock against bench stop and with back of boat against this, plane deck surface perfectly flat and smooth.

12. Gauge lines on bottom of hull from

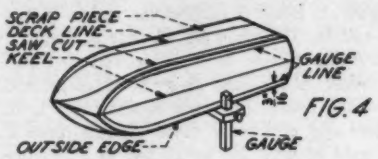


FIG. 4

prow to stern 3/16 in. from the outsides (Fig. 4). With plane and spokeshave, work off sides of hull from this line to edge of deck line. Clamp parts tight enough in vise so that it is impossible for any of them

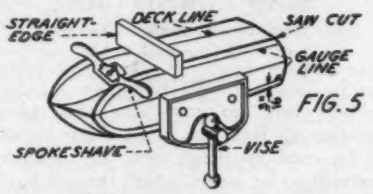


FIG. 5

to move. Test surface with straight edge (Fig. 5).

13. Remove bottom, gauge line on sawed surface of upper part of hull a scant 3/16 in. in from outsides as in operation 12. Lay out inside stern line (Fig. 6). Saw through stern and complete cutting out in-

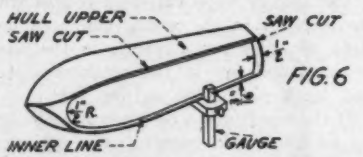


FIG. 6

side. Glue saw cut at rear of hull with waterproof glue and fasten joint with two No. 20 by ½-in. brass escutcheon pins. *Be careful not to place pins too close to edge so as to avoid splitting.* If a jig saw is available this saw cut will be eliminated.

14. Lay deck surface upon piece of wood

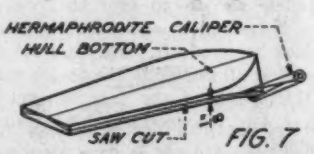


FIG. 7

prepared for deck and with a pair of hermaphrodite calipers or dividers, draw a line ⅛ in. outside sides of hull. Draw line even with stern of hull.

15. Draw line along outsides of bottom ⅛ in. down from sawed surface (Fig. 7), then glue and clamp bottom to upper part of hull with waterproof glue keeping all edges even and using slant scrap piece from top of hull block to bring bottom and deck surfaces parallel.

16. Saw out deck, then smooth and round side edges. Smooth stern edge square to face, round top edge, then sand all over with No. ½ sandpaper. Gauge a line on top surface 5/16 in. in from all edges and draw a center line from prow to stern. With parallel straight edge 3/16 in. wide, begin at center line and lay out flooring of deck. *Be sure not to draw any lines beyond 5/16-in. gauge line.*

17. Get out pieces for combing to proper size and shape, smooth and sand, then fasten to deck with waterproof glue. Set aside to dry.

18. Remove clamps from hull and hang them upon rack. Finish shaping bottom of

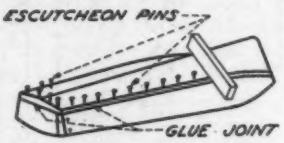


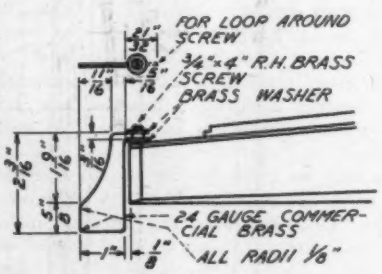
FIG. 8

hull from center or keel line to ⅛-in. line using a straight edge to test surface (Fig. 8). Sand all surfaces of hull *except deck joint* with No. 1, then No. ½ sandpaper. *Get instructor's approval,* then put on water line. Lay out propeller shaft tube hole center, then drill.

19. Decide on color scheme, then paint. Outside of hull to receive at least two coats of flat and three coats of enamel, or three coats of flat and two coats of spar varnish. Inside of hull to receive one coat of flat and one of enamel or spar varnish.

20. Saw out cockpit hole in deck, smooth off, then sand even with combing. Paint deck flooring natural finish, outside band to harmonize with hull.

21. Get brass material for rudder, square up two edges with mill file. Lay out shape according to drawing, indent center of small circles in corners with scratch awl and punch out proper-sized hole. Cut out



to lines with snips and cold chisel, then smooth up all edges with mill file. Form loop around screw with pair of pliers.

22. Install motor. Glue deck to hull and fasten joint with No. 20 by ½-in. brass escutcheon pins. Mount rudder.

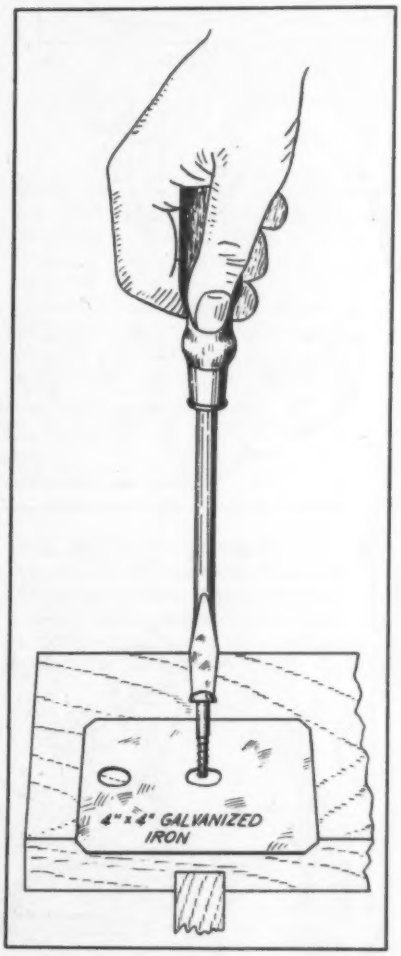
References: Operation sheets "Squaring Up Process," "Gluing Up Stock," and "Wood Finishing." (Stanley Charts Nos. 101 and 111.)

Related Material: This small boat is moved along in the water by the use of a screw propeller, the same as on large boats. The propeller works on the same principle as a wood screw when screwed into a piece of wood, the blades being a series of extremely coarse threads attached to a hub. The pitch or lead of a propeller's blades determines the distance a boat moves forward. Disregarding slippage and churning a 10-in. pitch should move a boat ahead 10 in. for each revolution.

SCREW-DRIVER SHIELD

Jos. J. Lukowitz, Milwaukee, Wisconsin

The use of a screw driver of the proper size and shape of tip will help greatly in



preventing the screw driver from slipping out of the screw slot and thus damaging the surface of the wood.

In the hands of an eager boy, however, even a screw driver with a properly shaped tip frequently jumps the screw slot. The accompanying illustration shows how a

simple shield may be used to protect the work from being marred by a slipping screw driver. The shield consists of a piece of galvanized iron 4 in. square, having two holes arranged as shown. The holes should be large enough to permit the largest screw head likely to be used to slip through easily.

A BENDING JIG

A. H. Luehring, Indiana State Teachers College, Terre Haute, Indiana

Figures 1 and 2 represent a bending jig that was designed for bending parts of bench metal projects. It has been used for several years in making parts of jardiniere stands, umbrella racks, magazine baskets, table and floor lamps, footstools, piano benches, end tables, flowerpot stands, hanging baskets, and articles of that nature. It is suitable for bending steel up to 3/16 in. thick by ¾ in. wide. While definite dimensions are given for the radius pieces, other dimensions, of course, may be used. The secret of making good scrolls for bench metal projects in high school is to make them without the use of a hammer, because high-school boys are too immature to do satisfactory work by the hammer method. Another advantage in using the jig is that one demonstration is sufficient for anybody to learn to use it.

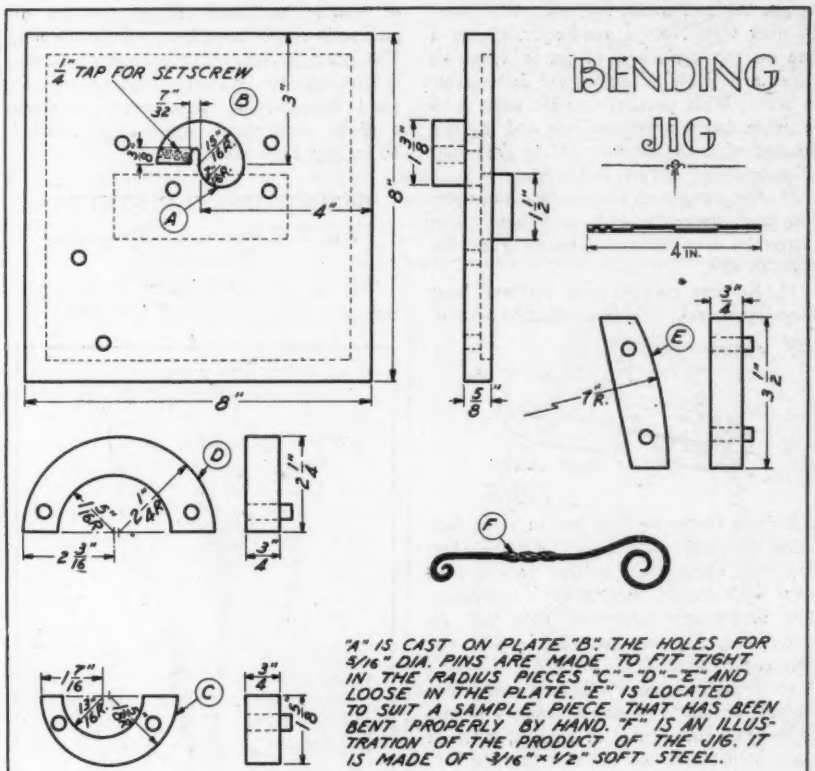

BENDING JIG
1/4" TAP FOR SETSCREW
7/32"
3"
8"
4"
4 IN.
1 1/2"
5/8"
3/4"
1" R.
2 1/4" R.
2 3/16"
1 7/16"
5/16" DIA.
"A" IS CAST ON PLATE "B". THE HOLES FOR 5/16" DIA. PINS ARE MADE TO FIT TIGHT IN THE RADIUS PIECES "C"-"D"-"E" AND LOOSE IN THE PLATE. "E" IS LOCATED TO SUIT A SAMPLE PIECE THAT HAS BEEN BENT PROPERLY BY HAND. "F" IS AN ILLUSTRATION OF THE PRODUCT OF THE JIG. IT IS MADE OF 3/16" × 1/2" SOFT STEEL.

FIG. 1

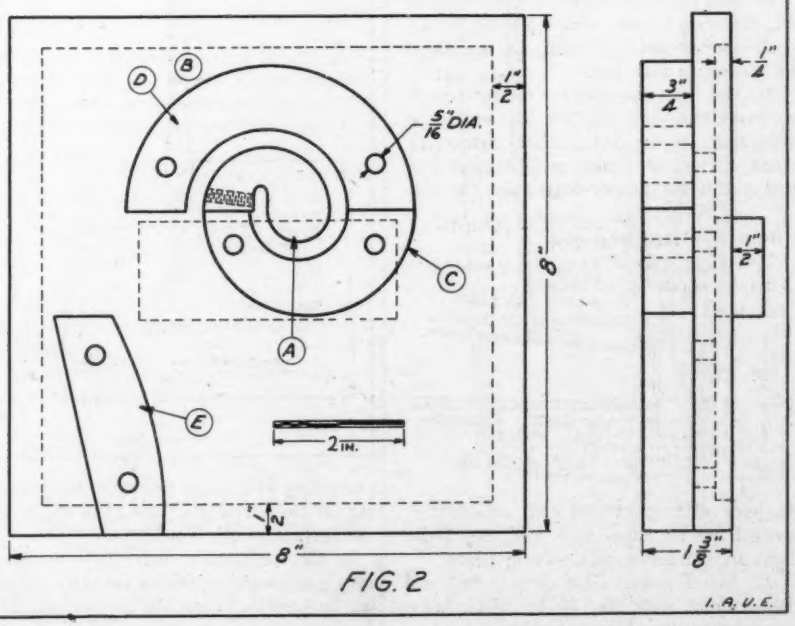


FIG. 2

I. A. V. E.

In using the jig, grip it in a machinist bench vise. Insert the end of the piece of steel to be curled in the 7/32-in. slot, Figure 1. Bend it around the radius pieces A and B. This may be all that is required for some pieces. If it is desired to make a spiral, put radius piece C in place and keep on going. Then put radius piece D in place and curl some more. Radius piece E is used to give the leg shown in F, Figure 1, the back bend. If, when starting to bend, the piece tends to slip out of the slot, the setscrew in radius piece B may be set down to hold it.

SLAB FURNITURE

W. Ben. Hunt, Hales Corners, Wisconsin

Materials

Slabs are the trimmings left after squaring up logs into lumber. See Figure 1. In rural districts, there are portable sawmills to be found, where farmers have their logs sawed. Around these mills one can usually find a pile of slabwood from which choice pieces for making slab furniture may be selected.

If one lives in the city, there are always fuel companies that handle cordwood and slabwood, even in this day of oil burners.

The kind of wood varies, of course, with the locality. In the south, one may find slabs of cedar and cypress; in the west, redwood and fir; in the northern states, oak, birch, pine, bass, and the like.

If the furniture to be made is to be left out of doors, oak, cypress, pine, and cedar are the best. If it is to be used in a log cabin or on the porch, any light wood will do. The lighter the wood for indoors, the better, because then the furniture may be made of thicker slabs and will look much sturdier than if made of a thinner hardwood slab. The city fuel dealers will usually allow one to go over the piles of slabwood and pick out suitable pieces. The slabs are cut 4 ft. long. In rural districts and at all saw mills, the length varies with the length of the logs brought in. However, 4 ft. is a good length for benches and tables.

Pick out slabs that run from 12 to 18 in. wide and from 3 to 6 in. in thickness at the thickest part. The bark, of course, is to

be left on in order to add beauty to the finished piece. If benches with backs are to be made, pick out a few slabs about 6 in. wide and about 1½ in. thick.

Saplings (Fig. 2) for legs, arms, and stretchers, also are needed. Here again the different localities yield different kinds of wood. If the saplings must be cut by the person using them, a trip into the country where woods and roadside brush abound is in order. If necessary, permission should be obtained from the owner to fell the saplings, and then the limbs and tops should be placed in heaps and not scattered all over the woods. Where tamarack swamps abound, farmers often cut poles in winter and stack them up. These are sold for various purposes, such as fence posts, gate posts, hay poles, etc. In such localities, saplings may be purchased for from 10 to 25 cents for a pole 15 to 25 ft. long and 2 to 3 in. at the butt end.

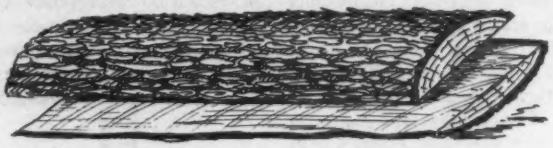


Fig. 1. The rough slabs

Fig. 2. Saplings

If tamarack is obtainable, it will be found easy to work. Saplings should run from 1 to 3 in. in diameter, depending on where they are to be used. If no tamarack is obtainable, any solid saplings will do. Ironwood, elm, ash, or any wood of a tough character free from knots or at least straight, the branches and knots can be trimmed off if need be. The saplings may be peeled or left with the bark on. Since slab furniture is not made of measured lumber, the dimensions given in this article are only general.

If slabs are not readily obtainable, this type of furniture may be made of softwood planks from 2 to 3 in. in thickness and from 12 to 16 in. in width. These, of course, would be purchased at a lumber yard and should preferably be of pine, or other softwood. The legs for plank furniture may be made by slightly rounding off 2 by 2-in. pieces of the same wood. The method of constructing plank furniture is practically the same as that used for building furniture with slabs and saplings.

Tools

Most of these rustic pieces may be made with an ax and a bit and brace, but other tools, such as the hand crosscut saw or bucksaw, a sharp hand ax, a drawknife, spokeshave, expansive bit, block plane, a few chisels, a hammer, and a mallet will make the work very much easier. If one is handy with or owns an adz, so much the better. Slabs finished with a sharp adz and sanded have a wonderful appearance.

Preparation of the Material

The preparation of slabs depends upon individual choice or ability. Some manufacturers of slab furniture run the cut side of the slab over a jointer and then sand it. That looks very commercial and is not consistent with the bark that is left on the other side. Others run them over a jointer to level them and then plane them by hand to give them the proper touch. Another way, and this is the one usually used by the writer, is to plane off only enough of the rough sawed surface to get it smooth, leaving a trace of the saw marks. The large-toothed saws, especially circular saws, used for sawing lumber leave a rough surface with millions of splinters. After planing off the rougher portion, it is usually necessary to sandpaper the surface to remove these splinters. The edges and ends should be cut as shown in Figure 3. Edges and corners are rounded with a drawknife or spokeshave.

Fig. 3. The slab ready for use

When slabs with rough bark are used, it is advisable to trim down the rougher part of the bark with a drawknife. White pine, hemlock, and tamarack bark, when shaved off, produce a surface of rich reddish brown interlaced with purple. The bark of yellow birch should be left as it is. The different woods found in different localities will need different treatment. However, when the bark is to be shaved down, lay the slab face down on a bench of some sort and clamp one end down, or nail a stop at the end nearest the worker. Then, with a drawknife, take off just enough of the rougher bark to give it a nice appearance.

Frequently, after slabs have been subjected to rain and snow, the bark loosens. This may be remedied by tacking the loose pieces down with shingle or lath nails after all work with the drawknife and bit is finished. Simply drive the nails wherever needed, then leave the slabs outdoors for a night or so, so that the nail heads will rust and in that way blend with the red or brown bark. If the bark is oiled before the nails are rusted, the heads will always appear unsightly.

The first thing to do in making the legs is to select one or more suitable saplings. Choose four pieces 17 in. long or longer and trim off all extending parts where limbs have been chopped off. This may be done with a knife or a spokeshave. Next, decide what size tenons are to be cut. As a rule, a little more than the bark of the piece having the smallest diameter is to be cut away. See Figure 4. Then set an expansive bit to bore a hole to fit this tenon. The other three legs are then marked with the bit as is shown in Figure 5. The holes in the slab must be bored with the same setting of the bit.

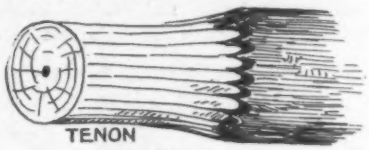


Fig. 4

Fig. 5

There are three ways in which legs or tenons may be fastened. Of course, if both the slab and the saplings used are well seasoned, one can simply put glue on the tenon and drive it home. But this is not the case in most instances. Therefore, it is well to use other means of fastening.

If a snug fit has been made, the leg may be driven home, and a large nail or spike driven in at an angle, as shown in Figure 6. This will do the trick, but there is no way of ever tightening such a leg should it loosen, except by driving another spike into it at another angle.

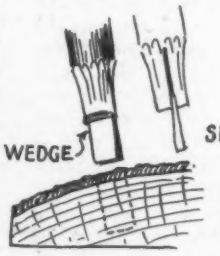


Fig. 6

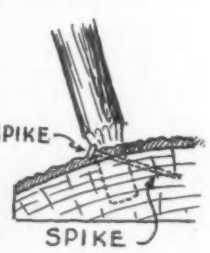


Fig. 7

The blind-wedge method shown in Figure 7 is another way. The tenon should

be fitted first, then a slot about 1½ in. deep is sawed at right angles to the grain of the wood, and a wedge of hardwood cut to fit. The wedge is then set into the slot and the leg driven in place. The wedge spreads the end of the tenon and holds it firmly. When green saplings are used, another method may be employed by boring the hole from the top of the slab all the way through, as is shown in Figure 8. If this method is used, the tenon is cut so that about ½ in. protrudes through the hole. Remove the leg and saw a slot down the center of the tenon and again drive it in place. Then drive a wedge in from the top and saw it off flush with the seat. Then when the wood dries and the legs loosen, the wedge may be driven in farther or a

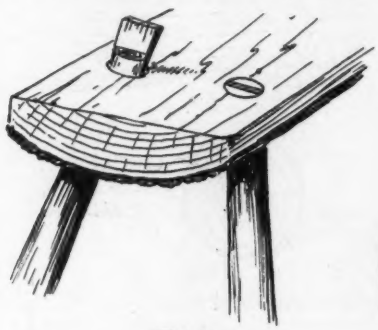


Fig. 8

thicker wedge put in place of it. Where slabs are quite thick, holes may be bored and dowels driven in, as shown in Figure 9.

To fasten the rungs, use nails as was done for fastening the legs, or bore holes through them and tie them in place with rawhide thongs, as shown in Figure 10. The thongs should be cut ¼ or ⅜ in. wide and soaked for about 12 hours before using. Pull them up as tightly as possible and conceal the ends. When the rawhide dries, it will shrink and hold for ages, provided no dampness reaches it. Varnishing it will help to keep dampness out. This method gives the furniture an added pioneer touch.

Finishing Slab Furniture

To finish furniture of this type, the first requirement is to bugproof the bark. A thorough brushing of 3 parts boiled linseed oil and 1 part turpentine will take care of this. If the furniture is to be left outdoors, do not use this oil on the worked surfaces of the slab, as it tends to turn dark in time. Outdoor furniture stands up better if the slab tops are given several coats of spar varnish. For indoor use a light coat of walnut stain, thinned down with turpentine and a coat or two of shellac or varnish will do very nicely on the raw wood. The bark on indoor furniture, too, should be given a good brushing of linseed oil and turpentine.

Sometimes the legs, rungs, and stretchers are made of peeled saplings. If the bark does not peel readily, it may be cut away with a drawknife. These peeled rounds should be finished the same as the slab tops.

Making a Bench

Select the slab that is to be used for the seat. Since the legs of these benches are usually set at an angle, it is well to make a jig, such as is shown in Figure 11, to act as a guide in boring the holes. The distance that the leg is set in from the edge and end of the slab depends upon the conditions. With thin slabs, it is best to bore the holes farther from the edge than on thicker slabs. For the average slab, the center of the hole should be about 4½ in. from the end and from 2½ to 3 in. from the edge. The angle on the boring jig should be between 15 and 20 deg.

Assemble the bench as has already been described. After the legs have all been

Fig. 9

Fig. 10

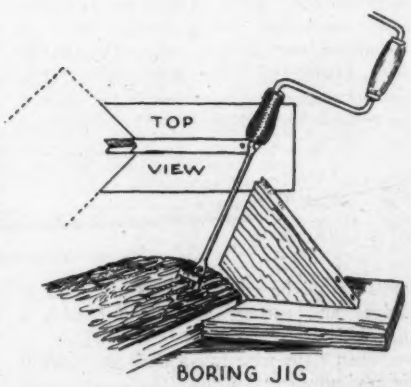


Fig. 11

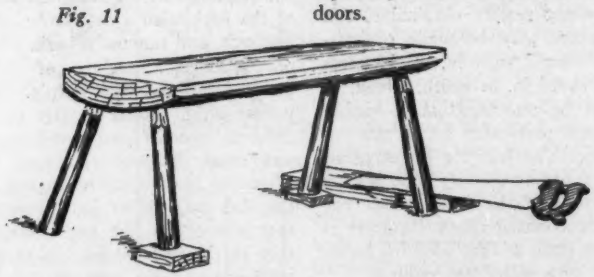


Fig. 12

fastened into the slab, the bench will require leveling. Set it on a level table or on the floor and level it up with small pieces of wood placed under the shorter legs as shown in Figure 12. Then use a piece of lumber of the right thickness as a saw guide (see Fig. 12). Saw halfway through each leg, then turn the bench on its side and finish sawing off each leg.

If rungs and stretchers are used, they should be thinner than the legs and the holes, and tenons should be 1 in. or even smaller if small saplings are used. When making a bench with rungs and stretchers, bore the holes, fit the legs and level off as before mentioned. Mark each leg as shown in Figure 13 with yellow crayon, so that it can be put back in the same position. Measure up 6 to 7 in. from the end of each leg and mark. Then place a rule as

Fig. 13

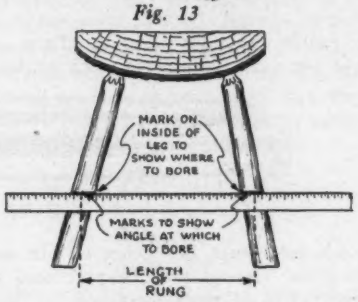


Fig. 14

shown in Figure 14 and draw a line along it. This gives the proper angle for the boring. Then mark the place on the inner side of each leg to show where to bore. Lastly, measure how long the rung is to be, measuring from the center of each leg, as shown in Figure 14. When ready to assemble, fit the legs and rung together first. Then drive the legs into the seat or slab, and fasten everything. Rungs, as a rule, need no special fastening, but a ⅜-in. dowel or a nail will always help to keep them in place, especially when the bench is to be left outdoors.

If a stretcher is to be added (see Fig. 15), fit the legs and rungs on each end temporarily and then measure the length of the stretchers. As the rungs may be turned without changing anything, bore the holes for the stretcher ends in the center of each rung without any special marking.

Fasten two lengths with their rung in

place at one end of the bench. Then assemble the other two legs with the rung and stretchers. Set them in place and drive everything together solidly. Dowels or nails may be used to fasten the ends of the stretchers.

Backs

Figure 16 shows a bench with back and arm rests. The arm rests may be left off, but they add considerable strength to the back. Figure 17 shows front and end views of such a bench. Note that the arms are set out farther to the edge of the seat, and should be set at a slight angle outward and backward. Smaller slabs are used for the back, and if one can be found with a curve to it, so much the better. The side view shows how the back is set into the upright.

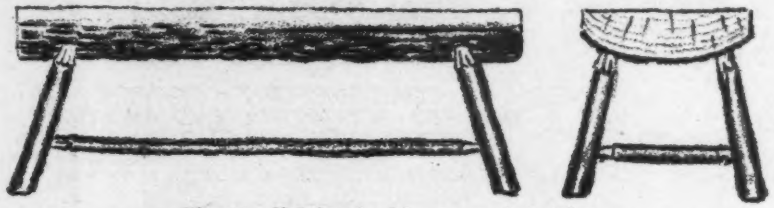


Fig. 15. Slab bench with rungs and stretcher

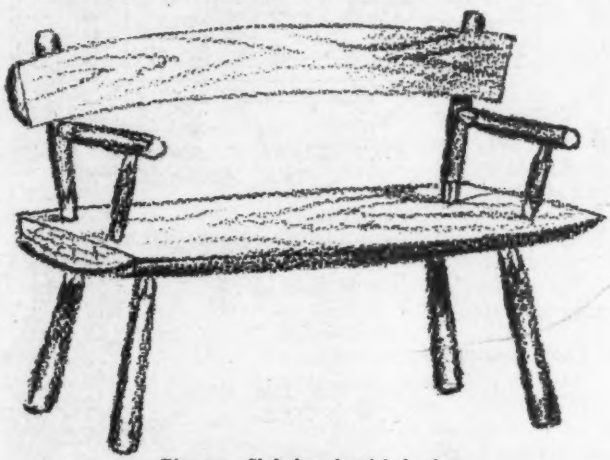


Fig. 16. Slab bench with back

Slab bench and chair

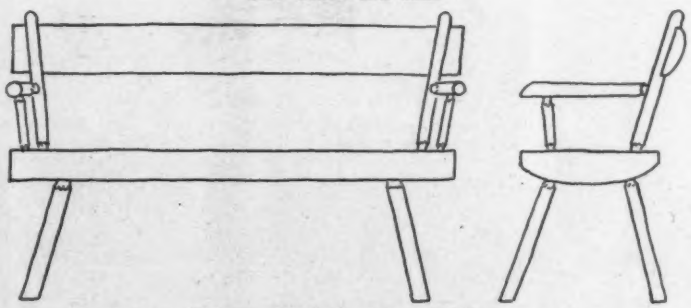


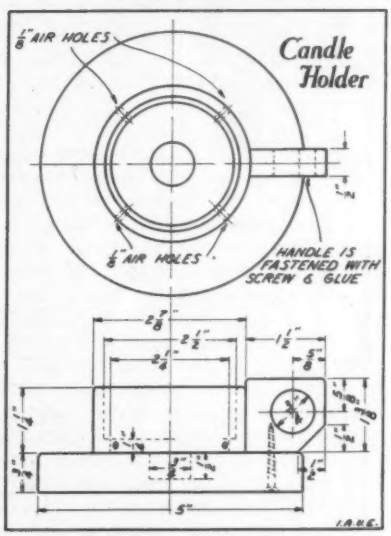
Fig. 17. Method of construction

The uprights are fastened into the slab just as is done with the legs. Then the back is simply set in and nailed on. Two narrow slabs may be used for the back instead of one wider one.

CANDLEHOLDER

Geo. G. Greene, Lane Technical High School, Chicago, Illinois

This is a simple project for faceplate turning. Use a No. 1 lamp chimney and see that it does not fit too tightly in the socket.

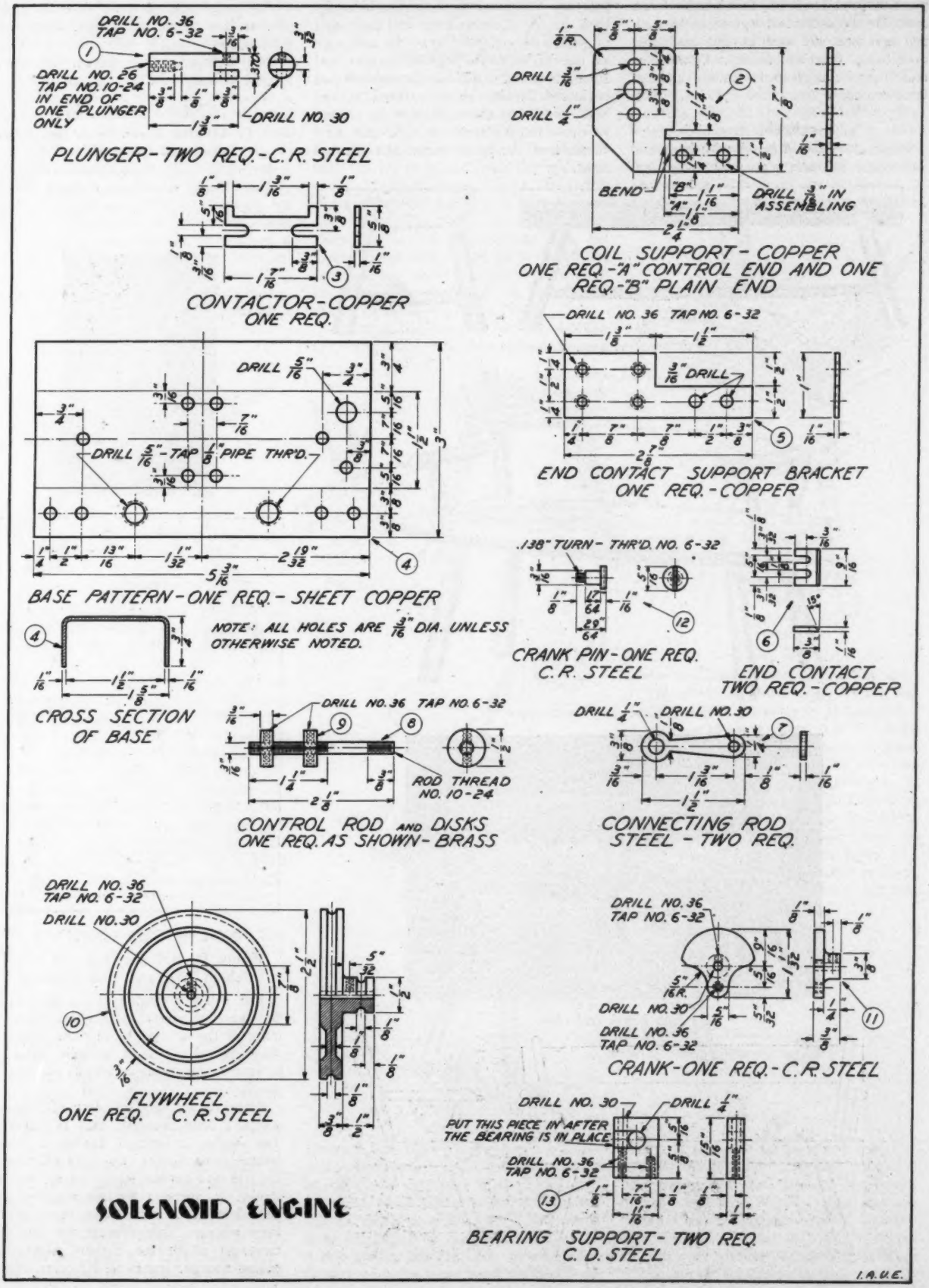


SOLENOID ENGINE

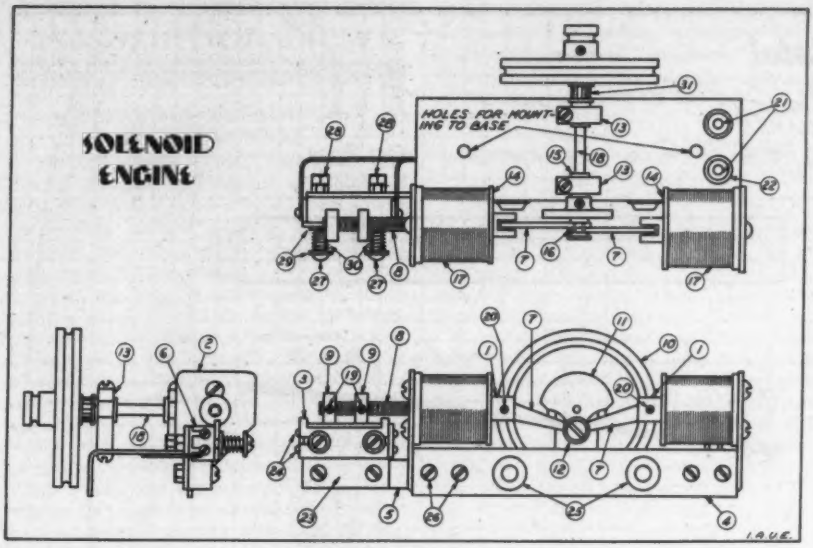
Frank D. Rohmer, Lincoln High School, Midland, Pennsylvania

The solenoid engine is an interesting and practical project within the ability to make of the average tenth-grade machine-shop student. It is a splendid piece of laboratory apparatus as well as an instructive toy.

Solenoids are used in place of magnets where a long magnetic pull is required. The engine submitted having a $\frac{5}{8}$-in. stroke, demonstrates this quite effectively. Its pull will average about 14 oz. for the stroke. It operates on two standard dry cells hooked in series, and draws about three amperes. Solenoids are not very efficient on alternating current which this engine also demonstrates. However, it will

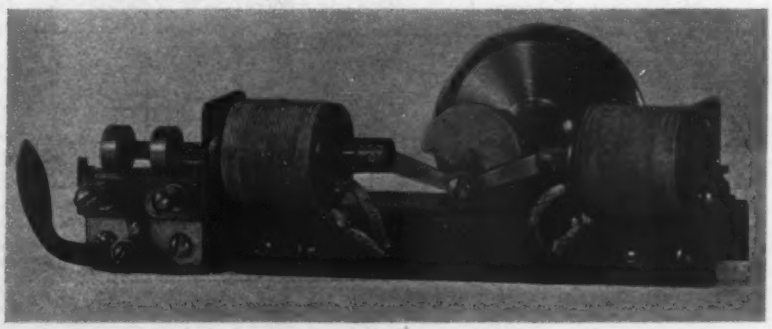


Details of engine. *(See page 226 for other details and for circuit diagram)*



Bill of Material

Part No.	No. Required	Name	Material	Size
1	2	Plunger	Cold-Rolled Steel	.370 Dia. x1⅜
2	2	Coil Support	Sheet Copper	1/16 x 1⅞ x 2¼
3	1	Contactor	Sheet Copper	1/16 x ⅝ x 1 7/16
4	1	Base	Sheet Copper	1/16 x 3 x 5 3/16
5	1	End Contact Support Bracket	Sheet Copper	1/16 x 1 x 2⅞
6	2	End Contact	Sheet Copper	1/16 x ⅜ x 9/16
7	2	Connecting Rod	Sheet Steel	1/16 x ⅜ x 1½
8	1	Control Rod	Brass Rod	3/16 Dia. x 2⅛
9	2	Control Rod Disks	Brass Rod	3/16 x ½ Dia.
10	1	Flywheel	Cold-Rolled Steel	⅞ x 2½ Dia.
11	1	Crank	Cold-Rolled Steel	⅜ x 1 1/32
12	1	Crank Pin	Cold-Rolled Steel	29/64 x 5/16 Dia.
13	2	Bearing Support	Cold-Drawn Steel	¼ x 11/16 x 15/16
14	2	Spool	Brass	1⅛ Dia. x 1¼
15	2	Bearing	Brass	5/16 Dia. x ⅜
16	2	Crank Bearing	Brass	¼ Dia. x ⅛
17	100 ft.	Coil	Magnet Wire	No. 20 d.c.c.
18	1	Shaft	Drill Rod	3 x ⅛ Dia.
19	4	Setscrews	Drill Rod	No. 6 — 32 x ¼
20	2	Wrist Pins	Drill Rod	⅜ x ⅛ Dia.
21	2	Binding Posts	Standard Screw	
22	2	Binding-Post Insulator	Fiber Sheet	½ Dia. x 1/16
23	1	End Contact Supports	Fiber Block	½ x 1 x 1⅜
24	4	Wood Screws	Steel, Blued	No. 1 x ½ r.h.
25	2	Bushings	Hard Rubber	⅛ Standard Socket
26	16	Machine Screws	Steel	No. 6 — 32 x 1
27	2	Machine Screws	Brass	No. 6 — 32 x 1½
28	20	Nuts, Hexagonal	Brass	No. 6 — 32
29	4	Washers	Brass	⅛ Dia. Standard
30	2	Springs	Brass	⅛ Dia. x ½
31	1	Gear or Distance Piece	Brass or steel	Clock Pinion (Optional)



Solenoid engine

run at a very high rate on about eight volts as delivered by the ordinary 75-watt toy transformer.

The photograph shows a "reverse" lever on the control end. This is not detailed on the drawings since it was added after the drawings and engine were completed. It is not needed, however, as the engine will run in either direction started. Should it be desired, the photograph shows it in sufficient detail. A small clock pinion acts as a "distance piece" (item No. 31 on the Bill of Material). This is soldered to the shaft, and it makes a splendid speed reducer when meshing with a larger clock gear. The crank pin bearings are soldered in to the large hole of the connecting rods. No "finish" is shown on the detailed parts as they are "finished all over."

This engine can be made on the lathe and with the ordinary bench tools as found in the average machine-shop section of an industrial-arts general shop. Nickle plating all metal parts and using nickle-plated machine screws will give the engine a decidedly workmanlike appearance.

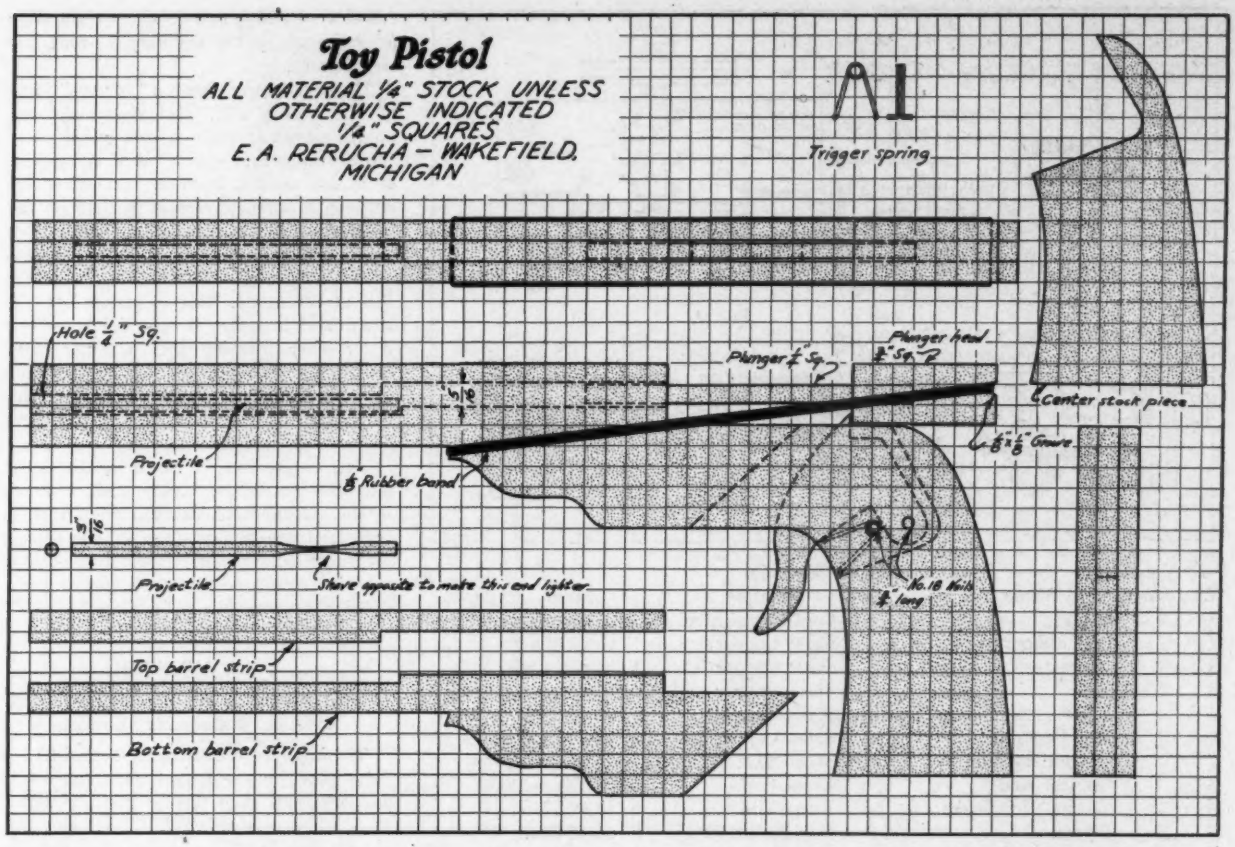
A TOY PISTOL

E. A. Rerucha, Wakefield Township Schools, Wakefield, Michigan

The toy pistol illustrated herewith, has been used by the author as a subject in seventh-grade shop sketching classes. Most boys are interested in pistols, and with that as an incentive the making of working drawings will receive the student's best efforts in the application of drawing principles. The pistol makes an excellent subject in that it involves making an assembly sketch, details, hidden lines, using of squares to define irregular curves, and making of a full-sized pattern. When used as a shop project, it will be found equally worth while in that it involves some of the tool processes to develop desired skills, and will hold the student's interest because when completed he has something for entertainment during his leisure time. For, what boy does not want a pistol that really shoots a projectile? The pistol will shoot a projectile such as a stick from a penny sucker candy with sufficient force to puncture a newspaper at a distance of 25 ft.

The material used is ¼-in. stock. Panel board will serve the purpose nicely except for the inside barrel strips for which solid pieces must be used. A somewhat smaller model may be made out of cigar-box parts.

When used as a drawing project, a demonstration with a model is first given to the students, and the details of construction and the mechanism explained, as also the application of the various drawing principles involved. The students then make their drawing from this information on paper ruled to ¼-in. squares. They can thus make a full-sized dimensioned sketch and work out the details, such as the curvature of the stock, the trigger, etc., themselves, since this information is not supplied to them directly, the aim being

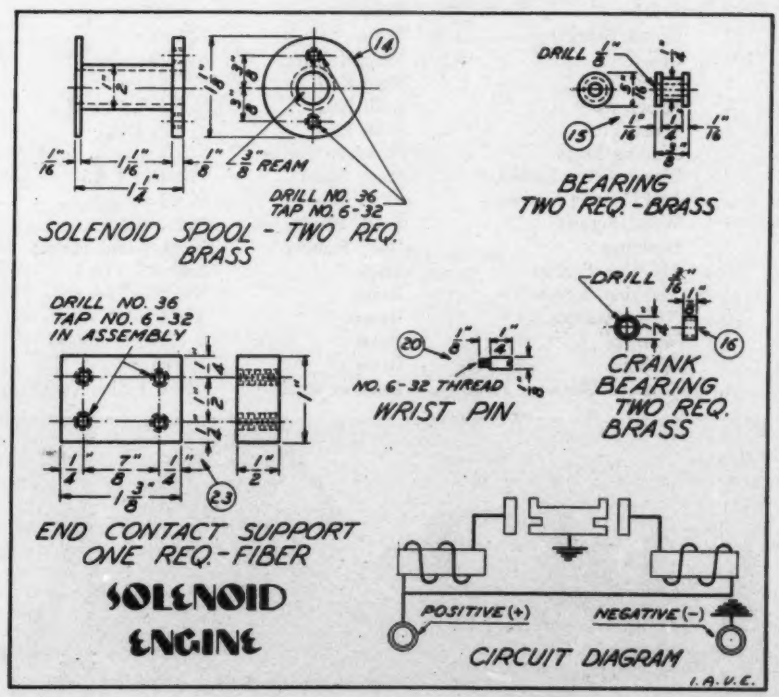


to provide an opportunity for the expression of original design as well as for the application of drawing principles.

The mechanics of the pistol are as follows: The driving force to the plunger is supplied by a ⅛-in. rubber band attached as shown in the drawing. The trigger is free to move about the nail holding it in place. A spring made from a safety pin by cutting off the point and the catch, and bending not quite ⅛ inch of the ends at right angles to an axis through the center of the hole. This spring is fastened back of the trigger by means of a nail driven through the two sides. Its purpose is to force the trigger forward and the prong or catch at the top of the trigger against the plunger. When the plunger is pulled back, the prong on the trigger will engage back of the shoulder of the plunger and hold the plunger against the tension of the rubber band until the trigger is pulled to release it. The projectile is pushed through from the muzzle. When the trigger releases the plunger, it strikes the projectile, sending it on its way.

The round sticks from the ordinary penny sucker candies make fine projectiles. Cut off some of the wood on opposite sides on one end, as shown in the drawing, so that the front end of the projectile is slightly heavier. The projectile will then fly without tumbling.

A sheet of ordinary wrapping paper may be marked out as a target and suspended so that the projectiles are free to pass through. The youngsters will have a merry time trying out their marksmanship, and the author ventures to say that grown-ups too may confess a desire to try their luck.



Details of engine described on pages 223–225

Association News

WISCONSIN VOCATIONAL TEACHERS MEET

The Wisconsin Vocational Association celebrated the 25th anniversary of vocational schools in Wisconsin by a two-day conference at Madison on May 1 and 2, at which instructors and directors of vocational education from 40 cities attended. The conference took on the form of a homecoming, and a number of oldtimers were present to witness the improvement which a quarter century of pioneering had made possible. Their presence also gave encouragement to the younger teachers to press on in the path blazed by their elders.

The program was strong. Especially forceful were the speeches of Major Lester Prosser, Glenn Frank, and Edgerton. Music was generously contributed by several school organizations. Enthusiasm was everywhere in evidence. The early feeling of uncertainty, grouping, and lack of understanding, prevalent in 1911, has given way to a tone of confidence, optimism, and determination. The vocational schools of Wisconsin know whither they are going. There was a professional air about all the program.

It augurs well for the success of a plan when the several forces in the Commonwealth are behind it. At the Madison convention, it was apparent that employers, employees, and students, as well as educators, are working shoulder to shoulder to improve the plan of vocational education. The vocational schools of the state have hit their stride. Alterations in the law during these years have broadened and strengthened the program. Teachers and administrators have profited by experience and are in a much better position to cope with the peculiar problems incident to this part of the educational system.

At the sectional meetings, as well as in the main groups at the convention, it was evident that all were in an optimistic mood, that there was a determination to push forward, with a record accomplishment, and that the vocational schools of Wisconsin are definitely advancing toward the next milestone — the half-century mark.

WEST VIRGINIA ASSOCIATION MEETING

The fifteenth annual meeting of the Southern West Virginia Industrial-Arts Association was held on April 25, in the New River State College at Montgomery, with President G. E. Best presiding. More than 100 teachers representing all sections of West Virginia and parts of Ohio were in attendance.

Following the address of welcome, by President E. S. Maclin, of New River State College, Mr. John R. Ludington, of Muncie, Ind., talked on "Industrial-Arts Problems in Smaller-School Programs," and Mr. E. H. Shelton, Charleston, gave a demonstration in wood turning.

At the afternoon session, Mr. Elroy W. Bollinger, of the University of North Dakota, discussed the subject, "Industrial Arts in the Changing Education," in which he stressed that the most successful student is the one who is allowed to use his initiative, and whose broad training fits him to become a useful citizen. Mr. J. E. Nelson, state supervisor of trade and industrial education, explained recent developments in trade-school education in the state to meet local demands. — *Glenn E. Best.*

WESTERN WASHINGTON ASSOCIATION MEETS

The Western Washington Association of Industrial Education held its meeting on April 18, in the Monte Cristo Hotel, in Everett, Washington, with Mr. L. T. Small, of Everett, presiding. The topics "Should Information Concerning Local Industries be Given by Industrial-Arts Teachers as Part of Their Teaching Program" was the subject of discussion by a panel consisting of W. H. Mulhollan, leader, Ray Dalton, Everett; Ed. McCullough, Bellingham; L. H. Lemmel, Seattle; D. R. Lincoln, Mt. Vernon; and G. B. Wilch, Seattle.

This was followed by talks on the subjects, "The Problem of Unemployed Youth," by Rev. J. H. Wells, of Everett; and "The School, the Industry, and the Apprentice," by Frank Walsh, Everett.

On the afternoon program were Dr. R. E. Cook, Everett; J. J. White, Seattle, who spoke on "Co-ordination and Placement"; C. T. Miller, Tacoma, who talked on "Looking Ahead"; Herbert Ruckmick, Bellingham, who discussed "New Challenges for Industrial Arts"; A. H. Drews, Everett, who talked on "The New Washington Industrial-Education Association."

Following the program the group visited the all-city exhibit in the North Junior High School.

At the business meeting, Mr. A. H. Drews was elected secretary-treasurer for the next year. — *A. H. Drews.*

CONNECTICUT INDUSTRIAL-ARTS CONFERENCE

The second conference of the Connecticut Industrial-Arts Association was held on May 22 and 23, in the State Teachers' College, at New Britain, with 100 members and guests in attendance.

President Walter F. McAndrews presided at the sessions. The first speaker, Mr. Roland H. Spaulding, of New York University, speaking on the topic, "What Can be Done with Aviation," said that groundwork and preliminary training will shortly be taught in the high and trade schools of the state. Mr. Carl Weiler, of New York City, who spoke on the subject, "Wrought Iron as Practiced in the School Laboratory," gave an interesting lecture and demonstration on the possibilities of metalwork in the school.

At the Saturday meeting, Dr. Earl S. Russell, secretary of the Connecticut School Superintendents' Association, stressing two points of value for industrial-arts teachers, said that oftentimes too high a standard is demanded from all pupils, and he urged the encouragement of leisure-time activity and the providing of opportunities for co-operation. The address by Dr. Charles M. Herlihy, president of the State Teachers' College, Fitchburg, Mass., stressed research work by educational agencies, urging that more time be given for the study of secondary education. He spoke of the need of getting leaders of education to come to the meetings. Mr. R. V. Billington, agent of the U. S. Office of Education, speaking on the topic, "Future Craftsmen of America," said that the sole purpose of this program is to provide leisure-time activity and is not intended to train for earning a livelihood.

The business meeting was presided over by President McAndrews. Mr. John Kiely presented a report on membership, President Feuerstein submitted a report on the organization of the New England Industrial-Arts Association, Mr. John Cave and Mr. John Conroy gave a report on the ten-year goal committee, and Mr. Feuerstein presented the report of the award committee on medals. A motion was made and approved that the office of third vice-president be created, and that the offices of the association be held for two-year terms, with the first vice-president automatically becoming president. The executive committee was empowered to make arrangements for the next conference.

The following officers were elected for the next year:

President, Walter McAndrews, Hartford; first vice-president, Frank S. Whitman, Bridgeport; second vice-president, Lewis Hall, New Haven; third vice-president, Fred Martin, Bridgeport; secretary, Harry A. Barnicle, Hartford; treasurer, George S. Duncan, New Haven. — *Harry A. Barnicle.*

WESTERN ILLINOIS INDUSTRIAL-ARTS ROUND TABLE

The May meeting of the Western Illinois Industrial-Arts Round Table was held on May 13, in Monmouth, with 31 instructors, representing Aledo, East Moline, Galesburg, Kewanee, Moline, Monmouth, Sherrard, Macomb, and other communities, in attendance.

Mr. S. W. Morgan presided at the sessions. Mr. Wayne Wetzel, of the Macomb Teachers' College, the first speaker, gave a short talk on the topic, "Objectives." Mr. Wood, of Davenport, Iowa, who followed, extended an invitation to the group to visit the annual exhibit in Davenport from May 23 to 24. Mr. Nelson, of Monmouth, gave a talk on "Principles of Mechanical Perspective." A visit to the Monmouth Pottery, followed the discussion.

The next meeting will be held October 7, at East Moline. — *Paul V. McMorris.*

ARIZONA INDUSTRIAL-ARTS ASSOCIATION MEETS

The Arizona Industrial-Arts Association held its spring meeting on May 9, in the State College at Tempe, in connection with the state industrial-arts exhibit, sponsored by the American Association of Engineers.

At the morning session there was a discussion of the course of study for elementary schools, plans for strengthening the state organization, and steps to be taken looking toward the future of industrial arts in Arizona. A committee was appointed to make a state-wide survey of industrial-arts programs for the development of a new course of study for secondary schools. The speakers who participated in the program were Mr. Goff, of Phoenix, who talked on forging; Mr. Shehane, of Phoenix, who explained the course of study for a six weeks' unit in elementary electricity. At the annual banquet for engineers, Mr. J. C. Lincoln, president of the Lincoln Electric Company, was the principal speaker, talking on the subject of "Welding."

The afternoon session was a round-table discussion of general problems of industrial-arts teachers, with Mr. H. L. Stiles, of Nogales, presiding.

The next meeting will take place next fall, at the State Teachers' Institute, Phoenix.—*Wilbur S. Nay.*

AMERICAN HOME-ECONOMICS ASSOCIATION TO MEET

The annual meeting of the American Home-Economics Association will be held from July 6 to 10, in Seattle, Wash.

The sessions will be held in the Olympic Hotel and the Plymouth Church. There will be an exhibit of historic textiles and costumes.

KENTUCKY INDUSTRIAL-ARTS TEACHERS MEET

The industrial-arts teachers of Kentucky held their annual meeting in Louisville, in connection with the Kentucky Education Association, from April 15 to 18.

The convention centered its attention on the building up of a strong state organization. Following talks by E. W. Lockin of Berea College, L. T. Smith of Bowling Green Teachers' College, C. L. Jordan of the DuPont High School, Louisville, John A. Whitesel of the Dayton High School, and Roy A. Lawrence of Louisville, a committee was appointed to make plans for the strengthening of the organization.

A part of the plan is to complete a system of district associations for the entire state to correspond with the Northern Kentucky Industrial-Arts Association. The committee, comprising Noble G. Deniston, Richmond Teachers' College; L. T. Smith, Bowling Green Teachers' College; Jessie T. Mays, Morehead Teachers' College; E. W. Lockin of Berea College; R. A. Lawrence of Louisville; and John A. Whitesel of Dayton will conduct a series of meetings of the various district associations during the year 1936–37.

The last of the year's luncheon meetings of the North Kentucky Industrial-Arts Association was held May 4, at Covington, where a tour was made of the school shops. A group of 60 teachers, including guests from Cincinnati and Louisville, listened to an address by Dr. William A. Cook, of the University of Cincinnati, and Principal of Dayton High School. Elmer W. Christy of Cincinnati, and A. N. May, of the University of Kentucky, were made honorary members of the Association.

Officers elected for the next year are as follows: President, Louis H. Rogge, Louisville; Vice-president, Hugh L. Oakley, Georgetown; Secretary, John A. Whitesel, Dayton.—*John A. Whitesel.*

MINNESOTA TEACHERS MEET

The sectional meeting of the Schoolmen's Week, held April 7, at the University of Minnesota, in Minneapolis, attracted 95 industrial-arts teachers of the state. Mr. A. L. W. Johnson, of St. Cloud, presided.

Mr. Dean Schweickhart gave a talk on the A. V. A., while Mr. Morgan distributed a pamphlet entitled *Viewpoints in Vocational Education,* relating to a study made by the Minnesota committee; and Mr. Bauman read a paper on "Art and Its Relationship to Industrial Arts." Mr. Picha followed with a demonstration on soldering pewter.

The meeting closed with the election of the following officers: President, Mr. R. S. Fawver, Mountain Lake; secretary, Mr. G. V. Tyrrell, Riverton.—*G. V. Tyrrell.*

Personal News

PROFESSOR FRED C. WHITCOMB HONORED

Prof. Fred C. Whitcomb was guest of honor at a testimonal banquet, held in Ogden Hall of Miami University, Oxford, Ohio, in honor of the completion of thirty years of service as head of the department of industrial education and director of the division of practical arts.

FRED C. WHITCOMB
Director, Division of Practical Arts, Miami University

The luncheon was sponsored by the Gamma Chapter of Epsilon Pi Tau, a national honorary fraternity in industrial arts and vocational education, and was attended by 125 invited guests. Prof. William D. Stoner, associate professor of industrial education, acted as chairman of the luncheon arrangements, and Dr. Harvey C. Minnich, of the School of Education, was toastmaster. Among the speakers were Pres. A. H. Upham, Dr. E. J. Ashbaugh, Dr. J. W. Heckert, Dr. B. M. Davis, Prof. A. A. Grinnell, and Prof. Whitcomb.

Prof. Whitcomb is a graduate of Franklin College, and holds a diploma from Teachers College, Columbia, a B.S. degree from Franklin College, and has completed other special work in Pratt Institute. After ten years' service as a teacher and principal, he went to Miami University in 1903, and for the past thirty years has acted as head of the department of industrial education at that institution.

¶ Mr. Charles A. Burt, head of the practical-arts department, State Teachers College, Trenton, N. J., has retired after 42 years of teaching.

¶ Mr. Fred O. Armstrong has been appointed director of the practical-arts department of the State Teachers College, Trenton, N. J.

¶ Mr. Paul N. Wenger, manual-arts supervisor, Public Schools, Greenwich, Conn., has received the degree of doctor of education from New York University.

School-Shop Equipment News

NEW LATHE TOOL INSTRUCTION BOOKLETS

Two booklets, *How to Cut Screw Threads,* and *How to Grind Lathe Tool Cutter Bits,* have been issued by the South Bend Lathe Works, South Bend, Ind. These booklets are written so that they are easily understood. They are well illustrated, and offer the pupil a clear-cut idea of each operation. They may be had at a very nominal cost.

The first booklet, *How to Cut Screw Threads,* covers the whole subject thoroughly, gives a step-by-step description of the process, and includes formulas, tables, and definitions of terms relating to screw threads.

The second booklet, *How to Grind Lathe Tool Cutter Bits,* describes the methods for grinding all types of lathe bits, illustrates the angles to which each cutter bit must be ground, points out the applications for which each tool is to be used, and shows the manner of applying the tool to the work to obtain the maximum efficiency.

CHANGES IN PERSONNEL OF ATKINS COMPANY

The E. C. Atkins Company, saw manufacturers, of Indianapolis, Ind., have announced a number of changes in the firm.

Mr. E. C. Atkins, formerly superintendent of the company, has been made first vice-president; Mr. Keyes W. Atkins, vice-president in charge of sales and advertising; and Mr. H. C. Atkins, Jr., superintendent. These young men, all capable in their respective fields, will continue carrying on the business on the principles of fairness for which the Atkins firm always has been known.

SAMPLES OF CABINET WOODS

Albert Constantine and Son, Inc., 797 East 135th Street, New York City, who are equipped to supply veneers, American black walnut, and other fine cabinet woods, have prepared a collection of samples of 50 different kinds of fine cabinet woods from the forests of 21 countries.

These samples may be kept in the box in which they are shipped, or they may be mounted and finished.

The samples are neatly labeled for identification purposes and may be obtained at a very nominal price. Complete information may be obtained by writing to the Constantine Company, New York City.

ANNOUNCE NEW SERIES OF WALL CHARTS

The Stanley Rule & Level Company, New Britain, Conn., are reissuing their series of 32 wall charts, showing the details of hand tools and their correct uses in a new form. The new charts, 18 by 14 in. in size, are printed on both sides of heavy cardboard. They are lacquered, and provided with two brass eyelets across the top for hanging. The charts are printed in large type, making it easy for junior- and senior-high-school students to see and learn the details regarding the proper use of tools. A nominal charge is made for the charts.

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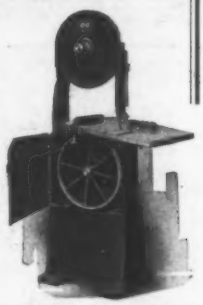

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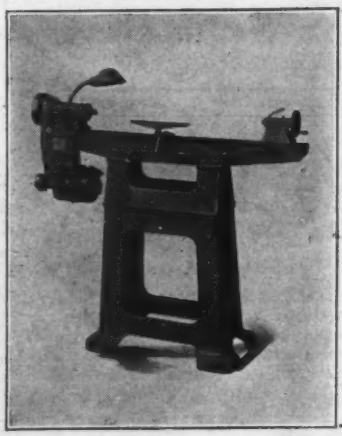

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New Publications

Model Boats for Boys

By Claude William Horst. Paper, 7¾ by 11, 47 pages. Price, 90 cents. Published by The Manual Arts Press, Peoria, Ill.

In this book the author describes the making of four different types of model boats. He shows how to use both the block method and the lift method of construction. There is also a chapter on fittings and hardware, and on regatta organization.

Designs for Wood-Carving

By Herbert W. Faulkner. Paper, 12½ by 9½, illustrated. Published by Harper and Brothers, New York City.

This is a supplement to *Wood-Carving as a Hobby* by the same author. There are 19 pages of excellent carving designs. These are accompanied by a sheet of tracing paper ruled off in large, medium, and small squares. Placing this tracing paper over any of the designs, permits the copying of the design to a smaller or larger scale.

Navy Yard Apprentice Training

An 8½ by 11½, 12-page reprint of an article by L. Q. Moss, which appeared in *Marine Engineering and Ship Age*, October, 1935. These reprints may be obtained from Mr. L. Q. Moss, U. S. Navy Yard, Philadelphia, Pa., at 15 cents each.

The article contains a historic account of apprenticeship as carried on in the U. S. Navy, since the establishment of the Navy Yards in 1799. It also describes the training program and shows the various forms that are used in carrying on the instructional work.

Teacher Training

By University of Akron in co-operation with State Board for Vocational Education, Trades and Industries, Columbus, Ohio.

Paper, 8½ by 10½, 114 mimeographed pages.

This book contains apprentice-training programs in the metal trades. The material is treated under six chapters. Chapter I, "Selection of Persons to be Trained"; Chapter II, "Administrative Details of Apprentice Training-Programs"; Chapter III, "Development of Course of Study Content"; Chapter IV, "Teaching Procedure"; Chapter V, "Bibliographical Material," and Chapter VI, "Conclusions and Recommendations."

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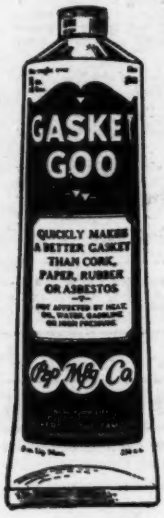

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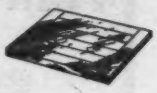

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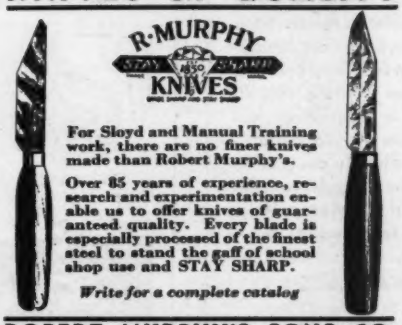

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